United States Department of Agriculture

Natural Resources Conservation Service and Forest Service

In cooperation with the Research Division of the College of Agricultural and Life Sciences, University of Wisconsin

Soil Survey of Forest County, Wisconsin



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How To Use This Soil Survey

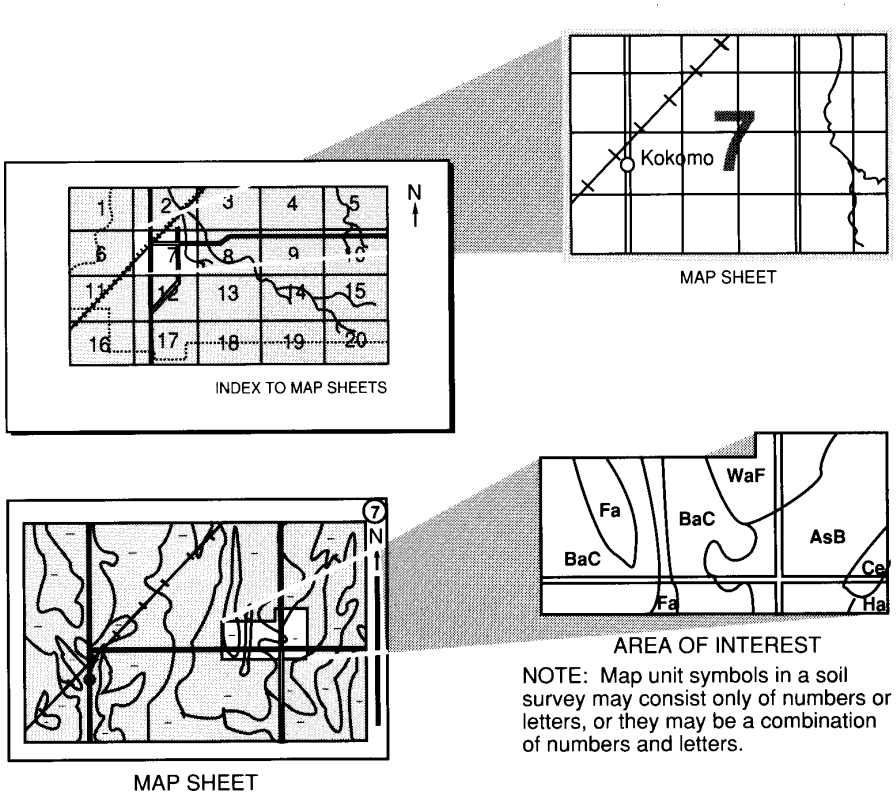
Detailed Soil Maps

The detailed soil maps can be useful in planning the use and management of small areas.

To find information about your area of interest, locate that area on the **Index to Map Sheets**. Note the number of the map sheet and turn to that sheet.

Locate your area of interest on the map sheet. Note the map unit symbols that are in that area. Turn to the **Contents**, which lists the map units by symbol and name and shows the page where each map unit is described.

The **Contents** shows which table has data on a specific land use for each detailed soil map unit. Also see the **Contents** for sections of this publication that may address your specific needs.



This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (formerly the Soil Conservation Service) has leadership for the Federal part of the National Cooperative Soil Survey.

Major fieldwork for this soil survey was completed in 1995. Soil names and descriptions were approved in 1995. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1995. This survey was made cooperatively by the Natural Resources Conservation Service, the Forest Service, and the Research Division of the College of Agricultural and Life Sciences, University of Wisconsin. The survey is part of the technical assistance furnished to the Forest County Land Conservation Committee, which helped finance the fieldwork.

Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

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Cover: The many streams in Forest County and the fall colors of the northern hardwood forest make the survey area a popular vacation spot.

Additional information about the Nation's natural resources is available on the Natural Resources Conservation Service homepage on the World Wide Web. The address is http://www.nrcs.usda.gov.

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Foreword

This soil survey contains information that affects land use planning in this survey area. It contains predictions of soil behavior for selected land uses. The survey also highlights soil limitations, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

This soil survey is designed for many different users. Farmers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to ensure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. The information in this report is intended to identify soil properties that are used in making various land use or land treatment decisions. Statements made in this report are intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described, and information on specific uses is given. Help in using this publication and additional information are available at the local office of the Natural Resources Conservation Service or the Cooperative Extension Service.

Patricia S. Leavenworth
State Conservationist
Natural Resources Conservation Service

Where To Get Updated Information

The soil properties and interpretations included in this survey were current as of April 2003. More current information may be available from the Natural Resources Conservation Service (NRCS) Field Office Technical Guide at Rhinelander, Wisconsin, or online at www.nrcs.usda.gov/technical/efotg. The data in the Field Office Technical Guide are updated periodically.

More current information may also be available through the NRCS Soil Data Mart Website at http://soildatamart.nrcs.usda.gov/

Additional information about soils and about NRCS is available through the Wisconsin NRCS Web page at www.wi.nrcs.usda.gov.

For further information, please contact:

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Soil Survey of
Forest County, Wisconsin

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United States Department of Agriculture, Natural Resources Conservation Service and Forest Service,
in cooperation with
the Research Division of the College of Agricultural and Life Sciences, University of Wisconsin

Forest County is in northeastern Wisconsin (fig. 1). It is bounded on the north by the Upper Peninsula of Michigan and the Brule River, which forms the Wisconsin-Michigan boundary; on the east by Florence and Marinette Counties; on the south by Oconto and Langlade Counties; and on the west by Oneida and Vilas Counties. The county has a total area of 669,863 acres. Of this total, about 647,471 acres is land and 22,392 acres consists of bodies of water more than 40 acres in size. In 1990, Forest County had a population of 8,776. The city of Crandon is the largest community in the county and is the county seat. It had a population of 1,958 in 1990 (Wisconsin Legislative Reference Bureau, 1991). Logging, lumbering, recreation, tourism, manufacturing, and agriculture are the major enterprises in Forest County.

A reconnaissance soil survey of Forest County was made prior to 1916 as part of a survey of northeastern Wisconsin (Whitson and others, 1916). The current survey updates the earlier survey, provides more interpretive information, and has larger maps, which show the soils in greater detail. Also, the soil maps in the current survey are published on aerial photography.

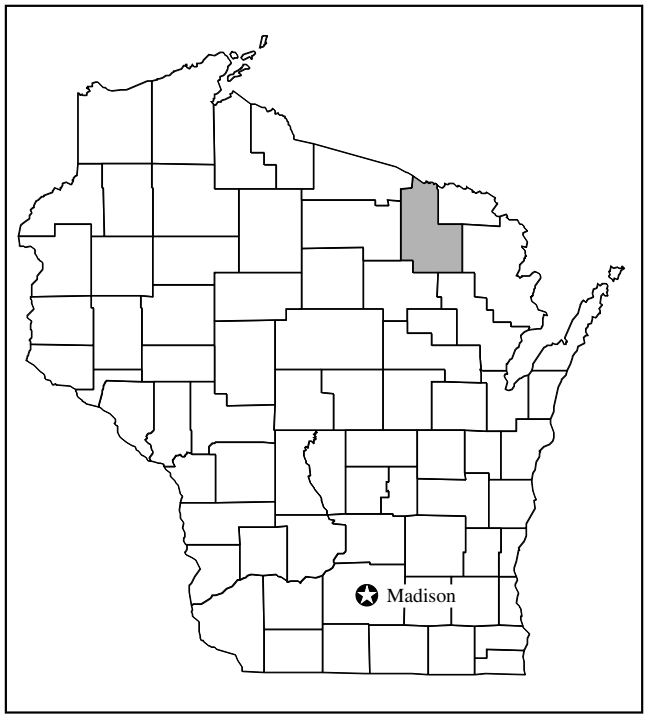


Figure 1.—Location of Forest County in Wisconsin.

General Nature of the County

This section provides general information about the county. It describes physiography, relief, and drainage; climate; water supply; history and development; and transportation facilities and industry.

Physiography, Relief, and Drainage

Forest County is located entirely in the Northern Highlands physiographic region, which was glaciated during the Pleistocene Age. The latest glaciation by the Langlade Lobe has determined the physiography, relief, and drainage of the survey area.

The elevation in the county generally ranges from about 1,800 feet above sea level in the west and northwest to about 1,300 feet in the southeast. The third highest point in the state, Sugar Bush Hill, is a drumlin east of Crandon (fig. 2). It rises about 1,938 feet above sea level (Wisconsin Legislative Reference Bureau, 1991). The west end of McCaslin Mountain, a Precambrian quartzite monadnock in the southeastern part of the county, is about 1,610 feet above sea level.

The Eastern Continental Divide directs the flow of surface water in Forest County into two major bodies of water—Green Bay and the Mississippi River. The vast majority of the surface water in Forest County flows to the east and southeast and eventually into Green Bay. Three major rivers—the Brule, the Pine,



Figure 2.—A view from Sugar Bush Hill. A bog with stunted black spruce and tamarack is in the center. Northern hardwoods are on the drumlinized upland in the foreground and background.



Figure 3.—The upper tributaries of the Peshtigo River meander through areas of Lupton, Cathro, and Markey soils.

and the Popple—flow in that direction and are part of the Menominee River watershed.

The Peshtigo River and its feeder streams encompass the largest watershed in the county (fig. 3). This river flows to the southeast and enters Green Bay in southeastern Marinette County. The Wolf River, whose headwaters originate at Pine Lake, flows southward into Lake Poygan in Winnebago County. Several small streams on the far western edge of the county flow to the west and are part of the Wisconsin River watershed.

The secondary drainage system in Forest County consists mainly of surface runoff and hillside seepage into basins and depressions. Some of these areas have drainage outlets, but most of this system tends to be poorly developed.

Climate

Winters in Forest County are very cold, and the short summers are fairly warm. The short frost-free period during the summer limits cropping mainly to forage crops, small grain, and adapted vegetables. Precipitation is fairly well distributed throughout the year but reaches a peak in summer. Snow covers the ground much of the time from late fall through early spring.

Table 1 gives data on temperature and precipitation for the survey area as recorded at Laona, Wisconsin, in the period 1952 to 1983. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter, the average temperature is 14 degrees F and the average daily minimum temperature is 4 degrees. The lowest temperature on record, which occurred on January 17, 1982, is -39 degrees. In summer, the average temperature is 63 degrees and the average daily maximum temperature is 76 degrees. The highest recorded temperature, which occurred on July 26, 1955, is 100 degrees.

Growing degree days are shown in table 1. They are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (50 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

The total annual precipitation is about 30 inches. Of this total, more than 21 inches, or about 70 percent, usually falls in April through September. The growing season for most crops falls within this period. In 2 years out of 10, the rainfall in April through September is less than 18 inches. The heaviest 1-day rainfall during the period of record was 4.32 inches on June 14, 1981. Thunderstorms occur on about 34 days each year.

The average seasonal snowfall is about 67 inches. The greatest snow depth at any one time during the period of record was 56 inches. On the average, 93 days of the year have at least 1 inch of snow on the ground. The number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 60 percent. Humidity is higher at night, and the average at dawn is about 80 percent. The sun shines 65 percent of the time possible in summer and 45 percent in winter. The prevailing wind is from the southwest. Average windspeed is highest, 12 miles per hour, in spring.

Water Supply

Forest County has many streams, lakes, and rivers that furnish a good supply of surface water. The county has 24,094 acres of surface water. There are 155 lakes more than 10 acres in size in the county. These lakes make up 21,367 acres of water (fig. 4). Streams in the county have a surface area of 1,770 acres and a total length of 710 miles. The majority of these streams are classified as trout waters (Steuck and Andrews, 1977). Surface water is used mainly for recreation, stock watering, and wildlife. Ground-water resources supply most of the water used in Forest County. It is readily available in quantities necessary to meet domestic, agricultural, municipal, and industrial needs.

The depth to ground water below the surface depends on the general topography, the elevation above the permanent stream level, and the lithology of the underlying bedrock and glacial deposits. Water is stored in porous and permeable strata called aquifers. The quantity of water that can be tapped from an aquifer depends on the thickness and extent of the aquifer, the rate of water movement through it, the recharge rate to the aquifer, and the storage capacity of the aquifer.

Glacial drift aquifers are the major source of ground water in most of the county. Large yields of ground water are available where the thickness of the saturated drift is at least 50 feet. The thickness of the glacial drift over most of the county ranges up to about 300 feet (Simpkins and others, 1987). The glacial drift produces well yields ranging from 5 to 1,000 gallons per minute. Yields of at least 500 gallons per minute are common. Most high-capacity wells range from 30 to 300 feet in depth (Oakes and Cotter, 1975; Oakes and Hamilton, 1973; Olcott, 1968).

Precambrian crystalline rock underlying the county is not considered a significant source of water. The availability of water from the bedrock is difficult to predict and is probably less than 5 gallons per minute. The glacial drift aquifer above the bedrock is the best source of ground water.

The quality of ground water in Forest County is generally good. The ground water is suitable for most domestic, municipal, and industrial uses, but treatment may be required for special purposes. The water in the aquifers is principally a calcium magnesium bicarbonate type. It is moderately hard or hard. A high content of iron is a problem in many wells, but it is not a health hazard. Local differences in the quality of ground water are a result of the composition, solubility, and surface area of soil and rock particles through which the water moves and the length of time the water is in contact with these materials (Oakes and Cotter, 1975; Oakes and Hamilton, 1973; Olcott, 1968).

The least mineralized water is from the glacial drift aquifer. This water has typically moved through material of high permeability, and thus the contact time between the water and soluble minerals is less significant than in other areas. Water from the crystalline bedrock aquifer is the most mineralized because the material is relatively less permeable and the water has had the longest contact time with soluble minerals.



Figure 4.—Some of the glacial landforms in Forest County, such as pitted outwash plains, have resulted in the formation of lakes.

History and Development

Sheila Landsverk, instructor, University of Wisconsin-Extension, helped prepare this section.

Forest County was originally inhabited by Potawatomi, Menominee, Brotherton, and Ojibwa (Chippewa) Indians. The survey area was visited by the early French explorers, fur traders, and missionaries during the period when the French were active in Wisconsin (1643-1763). Jean Nicolet, for whom the Nicolet National Forest is named, is assumed to have been the first European visitor to the area. However, there is no historical record of any settlement being made within the county during the French occupation or during the period of English domination (1763-1814).

In 1885, the State of Wisconsin passed an act creating Forest County from territory that included Oconto and Langlade Counties. Boundary changes occurred shortly thereafter, but it was not until 1905 that the present boundaries of the county were determined. The county was given its name because of the dense woodland that existed in the area at that time.

The Mole Lake Reservation was reserved for the Sokaogon Band of the Ojibwas in 1934. Today this band owns approximately 2,000 acres. The Potawatomi tribal lands in Forest County consist of scattered holdings totalling about 11,766 acres in

Blackwell, Lincoln, and Wabeno Townships. The most populated community is near Lake Lucerne. Other communities are at Carter, Wabeno, and Blackwell. Forest County includes many Native American tribal burial grounds.

The original trails in Forest County were developed by the Native Americans. The Lake Superior Trail, built between 1861 and 1862, ran from north to south across the county. It was used only during the winter months for hauling mail and supplies and for driving cattle used to feed the miners in nearby Michigan.

When the timber companies began logging in Forest County, they built narrow roads to connect their camps with the supply bases that were usually located at Wausau, Appleton, or Shawano.

Old Military Road was built during the Civil War to transport soldiers between Fort Howard in Green Bay and Fort Wilkins in Michigan. This road, more than any other road, opened up the vast expanse of the Wolf River country to the early traders and stimulated the growing momentum of the timber industry.

The vast forests in the area attracted an expanding lumber industry that began operating in the county in 1842. Sawmills were set up along the Peshtigo River and along other nearby rivers. These bodies of water served as the main means of log transportation. Sugar maple, hemlock, and yellow birch were the dominant species in the county, but the main timber harvested during the early logging period was eastern white pine. By 1866, most of the pine stands close to streams and lakes had been harvested, and the loggers began to harvest the hemlock and hardwoods.

In the early part of the 20th century, railroads replaced water as the method of transporting lumber from the area. The Soo Line Railroad, built in 1887, served Cavour and Argonne. The Chicago Northwestern Railroad was built in the late 1880's and served Carter, Wabeno, Padus, Blackwell Junction, Laona, Cavour, Newald, and Popple River. The advent of this faster means of transporting lumber resulted in the harvesting of most of the hemlock. Today, northern hardwoods and aspen are the primary forest types in the county. These species provide material for the lumber and pulp industries (fig. 5).

Farming in Forest County had its origin in the need for agricultural products by the lumber companies. In 1890, there were 47 farms in the county and the average farm size was 171 acres. By 1910, the number of farms had increased to 237 and the average farm size was 119 acres; by 1935, the county had 915 farms with an average size of 100 acres. After that period, the number of farms in Forest County began to decline dramatically. In 1950, the county had a total of 652 farms and the average size was 133 acres (Wisconsin Department of Agriculture, 1957). By 1959, the number of farms had decreased to 294 (Forest County, 1964). In 1990, Forest County had only 140 farms, and the average size was over 214 acres (Wisconsin Agricultural Statistics Service, 1991).

Today Forest County continues its progression with lumbering. Major employment is in timber-related industries, and independent loggers still predominate. Other major employers are the school systems, local and county government, the U.S. Forest Service, and the casinos at Mole Lake and Carter.

Transportation Facilities and Industry

Forest County has an excellent system of roadways. The major routes are U.S. Highway 8 and State Highways 32, 52, 55, 70, 101, and 139. These highways total more than 153 miles. The county maintains an extensive network of county roads, mainly in the central and southern parts. In addition, local roadways (city, village, and town) account for more than 750 miles in the county. The county also has about 300 miles of forest and park roads that provide access for logging and recreation in the county's parks and forests (Wisconsin Legislative Reference Bureau, 1991).

Commercial air transportation is not available in Forest County; however, the cities of Rhinelander, Mosinee, and Green Bay offer excellent facilities. The Crandon Municipal Airport south of Crandon offers facilities for the landing of small private aircraft.

One railway line presently operates in the county. This railroad services Crandon, Argonne, Cavour, and Armstrong Creek. An abandoned rail line runs north and south from near Popple River through Laona to Wabeno.

The marketing of forest products is the largest industry in Forest County, but tourism, recreation, agriculture, and the potential for mining are also important to the economy. About 84 percent of the county is woodland and thus supports a large lumber and wood products industry. The largest manufacturing employers in the county are involved in industries that rely primarily on local wood sources. The main part of the labor force is involved directly in the manufacture and marketing of wood products.

More than half of the commercial forest land in Forest County is poletimber, although sawtimber was dominant in the earlier years of the logging industry in the county. Pulp production is a major use of the wood crop in Forest County today.



Figure 5.—Clearcutting of aspen provides material for pulp and leaves slash on the ground to protect the soil surface.

The production of maple syrup is also an important enterprise in Forest County. Sap is refined into maple syrup or sold to major refineries in the area (fig. 6). The potential for increased production is tremendous because the county has large acreages of sugar maple.

The tourism and recreation industry has long been and will continue to be an important part of the economy of Forest County. Many businesses benefit from this industry because these are year-round enterprises. The numerous lakes and streams and vast areas of forest provide opportunities for fishing, hiking, boating, skiing, swimming, and camping. The wildlife species in the area, especially white-tailed deer, attract hunters from around the state. In most winters the snowfall is sufficient for cross-country skiing, snowmobiling, and snowshoeing.

Hay, oats, corn, and barley are the main crops grown in Forest County. Potatoes, sweet corn, and other specialty crops are grown on a limited basis. Livestock production and dairy farming are also a part of Forest County agriculture.

Mineral excavation activity in Forest County at the present time is minor; however, the mineral deposits



Figure 6.—The collection of sugar maple sap in an area of Pence sandy loam, 0 to 6 percent slopes.

south of Crandon contain zinc, copper, silver, gold, and lead. It is estimated that this area contains about 67 million tons of ore at a depth ranging from 450 feet to about 1,950 feet below the ground surface (Wisconsin Department of Natural Resources, 1986). Deposits of sand and gravel are scattered throughout the county and are used for construction material. Glacially transported cobbles and stones are sold for decorative purposes.

How This Survey Was Made

This survey was made to provide information about the soils and miscellaneous areas in the survey area. The information includes a description of the soils and miscellaneous areas and their location and a discussion of their suitability, limitations, and management for specified uses. Soil scientists observed the steepness, length, and shape of the

slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They dug many holes to study the soil profile, which is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

The soils and miscellaneous areas in the survey area are in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Detailed Soil Map Units

The map units delineated on the detailed soil maps in this survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions in this section, along with the maps, can be used to determine the suitability and potential of a unit for specific uses. They also can be used to plan the management needed for those uses.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, inclusions. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, inclusions. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. The contrasting components are mentioned in the map unit descriptions. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Pence sandy loam, 0 to 6 percent slopes, is a phase of the Pence series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are called complexes or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Pence-Vilas complex, 0 to 6 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use

and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Loxley, Beseman, and Dawson peats, 0 to 1 percent slopes, is an undifferentiated group in this survey area.

This survey includes *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Pits, gravel, is an example.

Table 4 gives the acreage and proportionate extent of each map unit. Other tables give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils or miscellaneous areas.

The detailed soil map units of Forest County join with similar detailed soil map units that may have different names in Florence and Langlade Counties, Wisconsin, and Iron County, Michigan. The Brule River forms part of the join between Forest County and Iron County. The detailed soil map units of Forest County do not fully join with those of Marinette, Oconto, Oneida, and Vilas Counties. The differences result partly from variations in the extent and pattern of the soils in the counties. Some of the differences are the result of map units in adjacent counties joining soil complexes in Forest County. These differences do not significantly affect the use of the detailed soil maps.

ArB—Argonne-Sarwet sandy loams, 1 to 6 percent slopes, very stony

Setting

Landform: Drumlins and moraines
Landscape position: Shoulders and linear and slightly convex summits
Shape of areas: Irregular or long and narrow
Size of areas: 5 to 500 acres

Representative Profile

Argonne

Organic layer:
0 to 2 inches—black, very friable muck

Mineral surface layer:
2 to 5 inches—brown, friable sandy loam

Subsoil:
5 to 15 inches—dark brown and brown, friable sandy loam
15 to 29 inches—brown, friable sandy loam
29 to 54 inches—brown, mottled, firm sandy loam

Substratum:
54 to 82 inches—dark yellowish brown, friable gravelly sandy loam

Sarwet

Surface layer:
0 to 1 inch—dark reddish brown, friable sandy loam

Subsurface layer:
1 to 3 inches—dark reddish gray, friable sandy loam

Subsoil:
3 to 27 inches—brown, friable sandy loam
27 to 48 inches—strong brown and brown, mottled, friable sandy loam

Substratum:
48 to 60 inches—dark yellowish brown, mottled, friable sandy loam

Composition

Argonne soil and similar inclusions: 45 to 55 percent
Sarwet soil and similar inclusions: 35 to 45 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
- The well drained Laona and Sarona soils
- The well drained Padus and somewhat excessively drained Pence soils, which are underlain by sandy or sandy and gravelly glacial outwash
- Areas of stratified sandy, loamy, and silty deposits
- Areas of somewhat poorly drained soils in depressions and drainageways
- Areas of Argonne and Sarwet soils that are nonstony or are bouldery
- Sloping areas of Argonne and Sarwet soils

Similar inclusions:
- Areas of soils in which the upper layers are loamy sand, fine sandy loam, very fine sandy loam, loam, or silt loam
- Areas of soils in which the lower layers are loamy sand, gravelly loamy sand, cobbly loamy sand, or cobbly sandy loam

Soil Properties and Qualities

Drainage class: Moderately well drained
Seasonal high water table: Argonne—perched at a depth of 1.5 to 3.5 feet; Sarwet—perched at a depth of 2.5 to 3.5 feet
Depth class: Argonne—moderately deep to a fragipan; Sarwet—very deep

Permeability: Argonne—moderate in the upper part, slow in the fragipan, and moderate or moderately rapid in the substratum; Sarwet—moderate
Available water capacity: Argonne—low; Sarwet—moderate
Organic matter content: Argonne—very high in the organic layer and low or moderately low in the mineral surface layer; Sarwet—moderate in the surface layer
Percent of surface covered by stones: About 0.1 to 3.0

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other uses—cropland, pasture

Woodland

Suitability: Suited
Major management concerns: Argonne—equipment limitation, windthrow hazard, plant competition; Sarwet—equipment limitation, plant competition
Management considerations:
• Ruts form easily on unsurfaced roads during wet periods. Log landings and haul roads can be stabilized with gravel.
• Windthrow on the Argonne soil can be minimized by using harvest methods that do not leave the remaining trees widely spaced. The periodic salvaging of windthrown trees may be needed.
• Plant competition can be controlled by mechanical site preparation or by limited use of herbicides.

Cropland

Suitability: Well suited in areas where surface stones have been removed; poorly suited in other areas
Major management concerns: Water erosion, soil blowing, droughtiness, nutrient and pesticide loss, rock fragments
Management considerations:
• A conservation tillage system that leaves crop residue on the surface, contour stripcropping, and crop rotations that include close-growing crops help to control water erosion in the more sloping areas.
• Grassed waterways, diversions, and grade-stabilization structures help to prevent gully erosion and erosion from concentrated flow.
• Field windbreaks, wind stripcropping, a cover of crop residue, and a winter cover crop reduce the hazard of soil blowing and help to prevent the damage to plants caused by windblown sand.
• Crop yields are limited during most years by the restricted available water capacity. Irrigation can improve productivity.
• Crop residue management, additions of organic material, conservation tillage, and field windbreaks increase the water-holding capacity and conserve moisture. Reducing plant populations helps to ensure adequate moisture for all plants.
• Providing protection from water erosion, reducing chemical applications, and incorporating phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.
• Some areas have stones on the surface. Unless they are removed, the stones interfere with tillage.

Pasture

Suitability: Moderately well suited
Major management concerns: Argonne—soil blowing, droughtiness, rock fragments; Sarwet—soil blowing, rock fragments
Management considerations:
• Establishing a high-quality cover of grasses and legumes can reduce the hazard of soil blowing.
• Overgrazing depletes the plant cover, increases the hazard of soil blowing, and increases the extent of undesirable plant species.
• Forage yields on the Argonne soil are limited during most years by the restricted available water capacity. Drought-tolerant species are best suited to this soil.
• Restricting grazing during dry periods helps to maintain a high-quality cover of pasture plants.
• Surface stones may interfere with the use of machinery.

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Restricted permeability, wetness
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and state guidelines.

Dwellings without basements

Suitability: Argonne—moderately well suited; Sarwet—well suited
Major management concerns: Argonne—wetness, water erosion, soil blowing; Sarwet—water erosion, soil blowing
Management considerations:
• Onsite investigation is needed.
• Installing a subsurface drainage system and adding fill material to raise the elevation of the site can help to overcome the wetness in areas of the Argonne soil.
• Seeding and mulching exposed areas can help to control water erosion and soil blowing during and after construction.

Dwellings with basements

Suitability: Argonne—poorly suited; Sarwet—moderately well suited
Major management concerns: Wetness, water erosion, soil blowing, cutbanks caving
Management considerations:
• Onsite investigation is needed.
• Installing a subsurface drainage system and adding fill material to raise the elevation of the site can help to overcome the wetness.
• Seeding and mulching exposed areas can help to control water erosion and soil blowing during and after construction.
• In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: IVs in very stony areas; IIe in nonstony areas
Woodland ordination symbol: 3L (sugar maple)
Primary forest habitat type: ATD
Secondary forest habitat types: AQVib or AViO

Au—Au Gres loamy sand, 0 to 2 percent slopes

Setting

Landform: Outwash plains and stream terraces
Landscape position: Linear areas, depressions, and drainageways
Shape of areas: Irregular or long and narrow
Size of areas: 5 to 200 acres

Representative Profile

Surface layer:
0 to 2 inches—black, very friable loamy sand

Subsurface layer:
2 to 4 inches—reddish gray, very friable loamy sand

Subsoil:
4 to 29 inches—dark reddish brown and dark brown, mottled, very friable loamy sand
29 to 46 inches—dark yellowish brown, mottled, loose sand

Substratum:
46 to 60 inches—brown, mottled, loose sand

Composition

Au Gres soil and similar inclusions: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The moderately well drained Croswell soils in slightly convex areas
• Flink soils, which are underlain by stratified lacustrine deposits
• The poorly drained Kinross soils in the lower depressions and drainageways

Similar inclusions:
• Areas of soils in which the upper layers are sand, loamy fine sand, sandy loam, or fine sandy loam
• Soils that are fine sand or very fine sand throughout
• Soils that have a substratum of gravelly sand

Soil Properties and Qualities

Drainage class: Somewhat poorly drained
Seasonal high water table: Apparent, 0.5 foot to 1.5 feet below the surface
Depth class: Very deep
Permeability: Rapid
Available water capacity: Low
Organic matter content: Moderate in the surface layer

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other uses—cropland, pasture

Woodland

Suitability: Suited
Major management concerns: Equipment limitation, windthrow hazard, plant competition, seedling mortality
Management considerations:
• Wetness and low soil strength frequently limit access by machinery to the dry summer months or to periods when the soil is frozen or snow cover is thick.
• Ruts form easily on unsurfaced roads during wet periods. Log landings and haul roads can be stabilized with gravel.
• Windthrow can be minimized by using harvest methods that do not leave the remaining trees widely spaced. The periodic salvaging of windthrown trees may be needed.
• Plant competition can be controlled by mechanical site preparation or by limited use of herbicides.
• Seedling mortality can be minimized by planting vigorous nursery stock on the crest of cradle-knolls or on prepared ridges.

Cropland

Suitability: Poorly suited
Major management concerns: Soil blowing, droughtiness, nutrient and pesticide loss, wetness

Management considerations:
• Field windbreaks, wind stripcropping, a cover of crop residue, and a winter cover crop reduce the hazard of soil blowing and help to prevent the damage to plants caused by windblown sand.
• If the water table is lowered, crop yields are limited during most years by the restricted available water capacity. Irrigation can improve productivity.
• Crop residue management, additions of organic material, conservation tillage, and field windbreaks increase the water-holding capacity and conserve moisture. Reducing plant populations helps to ensure adequate moisture for all plants.
• Reducing chemical applications and providing split applications of nitrogen fertilizer at recommended rates during the growing season can reduce leaching losses and help to protect the quality of ground water.
• The proper scheduling of irrigation can minimize the leaching of plant nutrients and other chemicals out of the root zone and into the underlying ground water.
• The seasonal high water table may delay spring planting in wet years. Providing adequate drainage can improve crop production.
• Open ditches and tile drains remove excess surface water and improve internal drainage.
• Loose sand enters the tile lines unless a suitable filter covers the tile.
• Grading ditchbanks and protecting them with a plant cover help to prevent caving and erosion caused by flowing water.

Pasture

Suitability: Moderately well suited
Major management concerns: Soil blowing, nutrient and pesticide loss
Management considerations:
• Establishing a high-quality cover of grasses and legumes can reduce the hazard of soil blowing.
• Overgrazing depletes the plant cover, increases the hazard of soil blowing, and increases the extent of undesirable plant species.
• Reducing chemical applications and applying nitrogen fertilizer at recommended rates can reduce leaching losses and protect the quality of ground water.

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Poor filtering capacity, wetness
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and state guidelines.

Dwellings

Suitability: Poorly suited
Major management concerns: Dwellings without basements—wetness, soil blowing; dwellings with basements—wetness, soil blowing, cutbanks caving
Management considerations:
• Onsite investigation is needed.
• Installing a subsurface drainage system and adding fill material to raise the elevation of the site help to overcome the wetness.
• Seeding and mulching exposed areas can help to control soil blowing during and after construction.
• In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: IVw
Woodland ordination symbol: 6W (quaking aspen)
Primary forest habitat type: TMC

Ca—Capitola muck, 0 to 2 percent slopes, very stony

Setting

Landform: Drumlins and moraines
Landscape position: Linear areas, depressions, and drainageways
Shape of areas: Irregular or long and narrow
Size of areas: 5 to 60 acres

Representative Profile

Surface layer:
0 to 5 inches—black, friable muck

Subsoil:
5 to 22 inches—dark grayish brown, friable silt loam
22 to 36 inches—dark grayish brown, mottled, friable sandy loam

Substratum:
36 to 60 inches—brown, friable sandy loam

Composition

Capitola soil and similar inclusions: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The very poorly drained Cathro, Lupton, and Markey soils, which have organic layers 16 to more than 51 inches thick

• The somewhat poorly drained Mudlake soils in the higher landscape positions
• Areas of Capitola soils that are nonstony or are bouldery

Similar inclusions:
• Areas of soils in which the upper layers are sandy loam, fine sandy loam, or loam
• Areas of stratified sandy, loamy, and silty deposits
• Soils that have a substratum of loamy sand, gravelly loamy sand, gravelly sandy loam, sand, or gravelly sand

Soil Properties and Qualities

Drainage class: Poorly drained
Seasonal high water table: Perched, above or near the surface
Depth class: Very deep
Permeability: Moderate or moderately slow in the solum and moderately slow in the substratum
Available water capacity: Moderate or high
Organic matter content: Very high in the surface layer
Percent of surface covered by stones: About 0.1 to 3.0

Use and Management

Land uses: Dominant uses—woodland, habitat for wetland wildlife; other use—pasture

Woodland

Suitability: Suited
Major management concerns: Equipment limitation, windthrow hazard, plant competition, seedling mortality
Management considerations:
• Wetness and low soil strength generally limit access by machinery to the dry summer months or to periods when the soil is frozen or snow cover is thick. Reforestation is generally limited to natural regeneration or hand planting.
• Ruts form easily on unsurfaced roads during wet periods. Log landings and haul roads can be stabilized with gravel.
• Windthrow can be minimized by using harvest methods that do not leave the remaining trees widely spaced. The periodic salvaging of windthrown trees may be needed.
• Plant competition can be controlled by mechanical site preparation or by limited use of herbicides.
• Seedling mortality can be minimized by planting vigorous nursery stock on the crest of cradle-knolls or on prepared ridges.

Wetland wildlife habitat

Suitability: Suited in undrained areas
Major management concerns: Excessive sedimentation, chemical and nutrient pollution
Management considerations:
• Undrained areas of this soil can provide wetland wildlife habitat, provide for water purification and ground-water recharge, and minimize runoff and sedimentation.
• Maintaining a saturated condition, controlling sedimentation, and following recommended nutrient and chemical management practices on adjacent land help to protect wetland areas.
• In cultivated areas, providing adjacent nesting cover can enhance the habitat.

Pasture

Suitability: Poorly suited
Major management concerns: Soil blowing, wetness, ponding, rock fragments, low strength
Management considerations:
• Establishing a high-quality cover of grasses and legumes can reduce the hazard of soil blowing.
• Overgrazing depletes the plant cover, increases the hazard of soil blowing, and increases the extent of undesirable plant species.
• The number of suitable forage plants is limited by the seasonal high water table.
• Establishing or maintaining an improved pasture is difficult because of the ponding.
• Surface stones may interfere with the use of machinery.
• Low strength restricts the use of machinery. Livestock hooves cut the soil and damage the plant cover.

Cropland

Suitability: Generally unsuited because of excessive wetness, ponding, surface stones, the severe frost hazard, and low strength

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Restricted permeability, wetness, ponding
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and state guidelines.

Dwellings without basements

Suitability: Poorly suited
Major management concerns: Wetness, ponding, soil blowing
Management considerations:
• Onsite investigation is needed.
• Providing surface drainage, installing a subsurface

drainage system, and adding fill material to raise the elevation of the site help to overcome the wetness and ponding.
• Seeding and mulching exposed areas can help to control soil blowing during and after construction.

Dwellings with basements

Suitability: Generally unsuited because of ponding

Interpretive Groups

Land capability classification: VIIw in very stony areas; VIw in nonstony areas
Woodland ordination symbol: 7W (balsam fir)
Primary forest habitat type: Not assigned

CrA—Croswell loamy sand, 0 to 3 percent slopes

Setting

Landform: Outwash plains and stream terraces
Landscape position: Linear areas, toeslopes, and footslopes
Shape of areas: Irregular or long and narrow
Size of areas: 3 to 150 acres

Representative Profile

Surface layer:
0 to 1 inch—black, very friable loamy sand

Subsurface layer:
1 to 3 inches—brown, very friable loamy sand

Subsoil:
3 to 28 inches—dark reddish brown and brown, very friable loamy sand

Substratum:
28 to 60 inches—yellowish brown, mottled, loose sand

Composition

Croswell soil and similar inclusions: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Au Gres soils in depressions and drainageways
• Cublake soils, which are underlain by stratified lacustrine deposits
• The excessively drained Vilas soils in slightly convex areas
• Areas of Croswell soils that have slopes of 3 to 6 percent

Similar inclusions:
• Areas of soils in which the upper layers are sand, loamy fine sand, sandy loam, or fine sandy loam
• Soils that have a substratum of gravelly sand
• Soils that are fine sand or very fine sand throughout

Soil Properties and Qualities

Drainage class: Moderately well drained
Seasonal high water table: Apparent, 2.0 to 3.5 feet below the surface
Depth class: Very deep
Permeability: Rapid
Available water capacity: Low
Organic matter content: Low or moderately low in the surface layer

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other uses—cropland, pasture

Woodland

Suitability: Suited
Major management concerns: Windthrow hazard, plant competition
Management considerations:
• Windthrow can be minimized by using harvest methods that do not leave the remaining trees widely spaced. The periodic salvaging of windthrown trees may be needed.
• Plant competition can be controlled by mechanical site preparation or by limited use of herbicides.

Cropland

Suitability: Poorly suited
Major management concerns: Soil blowing, droughtiness, nutrient and pesticide loss
Management considerations:
• Field windbreaks, wind stripcropping, a cover of crop residue, and a winter cover crop reduce the hazard of soil blowing and help to prevent the damage to plants caused by windblown sand.
• Crop yields are limited during most years by the restricted available water capacity. Irrigation can improve productivity.
• Crop residue management, additions of organic material, conservation tillage, and field windbreaks increase the water-holding capacity and conserve moisture. Reducing plant populations helps to ensure adequate moisture for all plants.
• Reducing chemical applications and providing split applications of nitrogen fertilizer at recommended rates during the growing season can reduce leaching losses and protect the quality of ground water.

• The proper scheduling of irrigation can minimize the leaching of plant nutrients and other chemicals out of the root zone and into the underlying ground water.

Pasture

Suitability: Moderately well suited
Major management concerns: Soil blowing, droughtiness, nutrient and pesticide loss
Management considerations:
• Establishing a high-quality cover of grasses and legumes can reduce the hazard of soil blowing.
• Overgrazing depletes the plant cover, increases the hazard of soil blowing, and increases the extent of undesirable plant species.
• Forage yields are limited during most years by the restricted available water capacity. Drought-tolerant species are best suited to this soil.
• Restricting grazing during dry periods helps to maintain a high-quality cover of pasture plants.
• Reducing chemical applications and applying nitrogen fertilizer at recommended rates can reduce leaching losses and protect the quality of ground water.

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Poor filtering capacity, wetness
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and state guidelines.

Dwellings without basements

Suitability: Moderately well suited
Major management concerns: Wetness, soil blowing
Management considerations:
• Onsite investigation is needed.
• Installing a subsurface drainage system and adding fill material to raise the elevation of the site help to overcome the wetness.
• Seeding and mulching exposed areas can help to control soil blowing during and after construction.

Dwellings with basements

Suitability: Poorly suited
Major management concerns: Wetness, soil blowing, cutbanks caving
Management considerations:
• Onsite investigation is needed.
• Installing a subsurface drainage system and adding fill material to raise the elevation of the site help to overcome the wetness.
• Seeding and mulching exposed areas can help to control soil blowing during and after construction.
• In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: IVs
Woodland ordination symbol: 5S (quaking aspen)
Primary forest habitat types: AQV
Secondary forest habitat type: PMV

CuA—Cublake loamy sand, 0 to 3 percent slopes

Setting

Landform: Outwash plains, stream terraces, and glacial lake plains
Landscape position: Linear areas, toeslopes, and footslopes
Shape of areas: Irregular
Size of areas: 5 to 80 acres

Representative Profile

Surface layer:
0 to 4 inches—black, very friable loamy sand

Subsurface layer:
4 to 5 inches—brown, very friable loamy sand

Subsoil:
5 to 8 inches—reddish brown, very friable loamy sand
8 to 21 inches—brown, very friable sand
21 to 34 inches—yellowish brown, mottled, very friable sand

Substratum:
34 to 49 inches—yellowish brown, mottled, loose sand
49 to 60 inches—dark yellowish brown, mottled, friable, stratified very fine sandy loam and silt loam with thin strata of brownish yellow fine sand

Composition

Cublake soil and similar inclusions: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• Croswell soils, which are sandy throughout
• The somewhat poorly drained Flink soils in depressions and drainageways

• The excessively drained Vilas soils, which are sandy throughout; in slightly convex areas
• Areas of Cublake soils that have slopes of 3 to 6 percent

Similar inclusions:
• Areas of soils in which the upper layers are sand, loamy fine sand, sandy loam, or fine sandy loam
• Soils that have an apparent seasonal high water table
• Soils that are gravelly sand in the upper part of the substratum
• Soils that have a substratum of loamy sand, gravelly loamy sand, sandy loam, or gravelly sandy loam
• Soils in which the stratified loamy, silty, and sandy deposits are at a depth of less than 40 inches

Soil Properties and Qualities

Drainage class: Moderately well drained
Seasonal high water table: Perched, 2.0 to 3.5 feet below the surface
Depth class: Very deep
Permeability: Moderately rapid or rapid in the upper part and moderately slow or moderate in the lower part
Available water capacity: Low
Organic matter content: Moderately low in the surface layer

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other uses—cropland, pasture

Woodland

Suitability: Suited
Major management concerns: Windthrow hazard, plant competition
Management considerations:
• Windthrow can be minimized by using harvest methods that do not leave the remaining trees widely spaced. The periodic salvaging of windthrown trees may be needed.
• Plant competition can be controlled by mechanical site preparation or by limited use of herbicides.

Cropland

Suitability: Poorly suited
Major management concerns: Soil blowing, droughtiness, nutrient and pesticide loss
Management considerations:
• Field windbreaks, wind stripcropping, a cover of crop residue, and a winter cover crop reduce the hazard of soil blowing and help to prevent the damage to plants caused by windblown sand.
• Crop yields are limited during most years by the restricted available water capacity. Irrigation can improve productivity.
• Crop residue management, additions of organic material, conservation tillage, and field windbreaks increase the water-holding capacity and conserve moisture. Reducing plant populations helps to ensure adequate moisture for all plants.
• Reducing chemical applications and providing split applications of nitrogen fertilizer at recommended rates during the growing season can reduce leaching losses and protect the quality of ground water.
• The proper scheduling of irrigation can minimize the leaching of plant nutrients and other chemicals out of the root zone and into the underlying ground water.

Pasture

Suitability: Moderately well suited
Major management concerns: Soil blowing, droughtiness, nutrient and pesticide loss
Management considerations:
• Establishing a high-quality cover of grasses and legumes can reduce the hazard of soil blowing.
• Overgrazing depletes the plant cover, increases the hazard of soil blowing, and increases the extent of undesirable plant species.
• Forage yields are limited during most years by the restricted available water capacity. Drought-tolerant species are best suited to this soil.
• Restricting grazing during dry periods helps to maintain a high-quality cover of pasture plants.
• Reducing chemical applications and applying nitrogen fertilizer at recommended rates can reduce leaching losses and protect the quality of ground water.

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Poor filtering capacity, restricted permeability, wetness
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and state guidelines.

Dwellings without basements

Suitability: Moderately well suited
Major management concerns: Wetness, soil blowing
Management considerations:
• Onsite investigation is needed.
• Installing a subsurface drainage system and adding fill material to raise the elevation of the site help to overcome the wetness.
• Seeding and mulching exposed areas can help to control soil blowing during and after construction.

Dwellings with basements

Suitability: Poorly suited
Major management concerns: Wetness, soil blowing, cutbanks caving
Management considerations:
• Onsite investigation is needed.
• Installing a subsurface drainage system and adding fill material to raise the elevation of the site help to overcome the wetness.
• Seeding and mulching exposed areas can help to control soil blowing during and after construction.
• In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: IVs
Woodland ordination symbol: 7S (red pine)
Primary forest habitat types: AQV
Secondary forest habitat type: PMV

FeB—Fence silt loam, 0 to 6 percent slopes

Setting

Landform: Outwash plains, glacial lake plains, and moraines
Landscape position: Linear and slightly concave toeslopes
Shape of areas: Irregular
Size of areas: 5 to 60 acres

Representative Profile

Surface layer:
0 to 2 inches—dark reddish brown, friable silt loam

Subsurface layer:
2 to 3 inches—brown, very friable silt loam

Subsoil:
3 to 27 inches—brown, very friable and friable silt loam
27 to 42 inches—brown, friable very fine sandy loam

Substratum:
42 to 60 inches—dark yellowish brown, mottled, friable, stratified very fine sandy loam and silt loam with a few thin strata of fine sand

Composition

Fence soil and similar inclusions: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Gastrow soils in depressions and drainageways
• Goodwit soils, which are underlain by sandy or loamy glacial till or glacial mudflow sediment; in slightly convex areas
• Tipler and Vanzile soils, which are underlain by sandy or sandy and gravelly glacial outwash
• Areas that have stones or boulders on the surface
• Soils that are well drained
• Sloping areas of Fence soils

Similar inclusions:
• Areas of soils in which the upper layers are loamy fine sand, sandy loam, loam, fine sandy loam, or very fine sandy loam
• Eroded areas
• Soils that have an apparent seasonal high water table

Soil Properties and Qualities

Drainage class: Moderately well drained
Seasonal high water table: Perched, 2.5 to 3.5 feet below the surface
Depth class: Very deep
Permeability: Moderate in the solum and moderately slow in the substratum
Available water capacity: High
Organic matter content: Moderately low in the surface layer

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other uses—cropland, pasture

Woodland

Suitability: Suited
Major management concerns: Equipment limitation, plant competition
Management considerations:
• Ruts form easily on unsurfaced roads during wet periods. Log landings and haul roads can be stabilized with gravel.
• Plant competition can be controlled by mechanical site preparation or by limited use of herbicides.

Cropland

Suitability: Well suited
Major management concerns: Water erosion, nutrient and pesticide loss, poor tilth, low strength
Management considerations:
• A conservation tillage system that leaves crop residue on the surface, contour stripcropping, and

crop rotations that include close-growing crops help to control water erosion in the more sloping areas.
• Grassed waterways, diversions, and grade-stabilization structures help to prevent gully erosion and erosion from concentrated flow.
• Providing protection from water erosion, reducing chemical applications, and incorporating phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.
• Leaving crop residue on the surface or regularly adding other organic material helps to maintain fertility and good tilth and minimizes crusting.
• Low soil strength limits the use of farm equipment to periods when the soil is not wet.

Pasture

Suitability: Well suited
Major management concerns: Water erosion, nutrient and pesticide loss, low strength
Management considerations:
• Establishing a high-quality cover of grasses and legumes can reduce the hazard of water erosion.
• Overgrazing depletes the plant cover, increases the hazard of water erosion, and increases the extent of undesirable plant species.
• Reducing chemical applications and applying phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.
• Low strength restricts the use of machinery.

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Restricted permeability, wetness
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and state guidelines.

Dwellings without basements

Suitability: Well suited
Major management concerns: Water erosion
Management considerations:
• Onsite investigation is needed.
• Seeding and mulching exposed areas can help to control water erosion during and after construction.

Dwellings with basements

Suitability: Moderately well suited
Major management concerns: Wetness, water erosion, cutbanks caving
Management considerations:
• Onsite investigation is needed.
• Installing a subsurface drainage system and adding fill material to raise the elevation of the site help to overcome the wetness.
• Seeding and mulching exposed areas can help to control water erosion during and after construction.
• In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: IIe
Woodland ordination symbol: 3L (sugar maple)
Primary forest habitat type: AViO

FlA—Flink loamy sand, 0 to 3 percent slopes

Setting

Landform: Outwash plains, stream terraces, and glacial lake plains
Landscape position: Linear areas, depressions, and drainageways
Shape of areas: Irregular
Size of areas: 5 to 100 acres

Representative Profile

Organic layer:
0 to 1 inch—dark brown, very friable muck

Mineral surface layer:
1 to 3 inches—grayish brown, very friable loamy sand

Subsoil:
3 to 29 inches—brown, mottled, very friable loamy sand

Substratum:
29 to 44 inches—dark yellowish brown, mottled, loose sand
44 to 61 inches—strong brown, mottled, friable, stratified fine sandy loam and sandy loam with many thin strata of dark yellowish brown sand

Composition

Flink soil and similar inclusions: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• Au Gres soils, which are sandy throughout
• The moderately well drained Cublake soils in slightly convex areas

• Poorly drained soils in the lower depressions and drainageways

Similar inclusions:
• Areas of soils in which the upper layers are sand, loamy fine sand, sandy loam, or fine sandy loam
• Soils that have an apparent seasonal high water table
• Areas of soils in which the upper part of the substratum is gravelly sand
• Soils that have a substratum of loamy sand, gravelly loamy sand, or gravelly sandy loam
• Soils in which the stratified loamy and sandy deposits are at a depth of less than 40 inches

Soil Properties and Qualities

Drainage class: Somewhat poorly drained
Seasonal high water table: Perched, 1 to 2 feet below the surface
Depth class: Very deep
Permeability: Moderately rapid or rapid in the upper part and moderately slow or moderate in the lower part
Available water capacity: Low
Organic matter content: Very high in the organic layer; moderately low or moderate in the mineral surface layer

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other uses—cropland, pasture

Woodland

Suitability: Suited
Major management concerns: Equipment limitation, windthrow hazard, plant competition
Management considerations:
• Wetness and low soil strength frequently limit access by machinery to the dry summer months or to periods when the soil is frozen or snow cover is thick.
• Ruts form easily on unsurfaced roads during wet periods. Log landings and haul roads can be stabilized with gravel.
• Windthrow can be minimized by using harvest methods that do not leave the remaining trees widely spaced. The periodic salvaging of windthrown trees may be needed.
• Plant competition can be controlled by mechanical site preparation or by limited use of herbicides.

Cropland

Suitability: Poorly suited
Major management concerns: Soil blowing, droughtiness, nutrient and pesticide loss, wetness
Management considerations:
• Field windbreaks, wind stripcropping, a cover of crop residue, and a winter cover crop reduce the hazard of soil blowing and help to prevent the damage to plants caused by windblown sand.
• If the water table is lowered, crop yields are limited during most years by the restricted available water capacity. Irrigation can improve productivity.
• Crop residue management, additions of organic material, conservation tillage, and field windbreaks increase the water-holding capacity and conserve moisture. Reducing plant populations helps to ensure adequate moisture for all plants.
• Reducing chemical applications and providing split applications of nitrogen fertilizer at recommended rates during the growing season can reduce leaching losses and protect the quality of ground water.
• The proper scheduling of irrigation can minimize the leaching of plant nutrients and other chemicals out of the root zone and into the underlying ground water.
• The seasonal high water table may delay spring planting in wet years. Providing adequate drainage can improve crop production.
• Open ditches and tile drains remove excess surface water and improve internal drainage.
• Loose sand enters the tile lines unless a suitable filter covers the tile.
• Grading ditchbanks and protecting them with a plant cover help to prevent caving and erosion caused by flowing water.

Pasture

Suitability: Moderately well suited
Major management concerns: Soil blowing, nutrient and pesticide loss
Management considerations:
• Establishing a high-quality cover of grasses and legumes can reduce the hazard of soil blowing.
• Overgrazing depletes the plant cover, increases the hazard of soil blowing, and increases the extent of undesirable plant species.
• Reducing chemical applications and applying nitrogen fertilizer at recommended rates can reduce leaching losses and protect the quality of ground water.

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Poor filtering capacity, restricted permeability, wetness
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and state guidelines.

Dwellings

Suitability: Poorly suited
Major management concerns: Dwellings without basements—wetness, soil blowing; dwellings with basements—wetness, soil blowing, cutbanks caving
Management considerations:
• Onsite investigation is needed.
• Installing a subsurface drainage system and adding fill material to raise the elevation of the site help to overcome the wetness.
• Seeding and mulching exposed areas can help to control soil blowing during and after construction.
• In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: IVw
Woodland ordination symbol: 6W (red pine)
Primary forest habitat type: TMC

Fm—Fordum loam, 0 to 2 percent slopes

Setting

Landform: Flood plains
Shape of areas: Long and narrow
Size of areas: 10 to 100 acres

Representative Profile

Surface layer:
0 to 6 inches—very dark gray, friable loam

Substratum:
6 to 23 inches—dark gray and grayish brown, mottled, friable sandy loam
23 to 26 inches—gray, mottled, friable silt loam
26 to 60 inches—yellowish brown and brown, mottled, loose sand and gravelly sand

Composition

Fordum soil and similar inclusions: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The very poorly drained Cathro, Lupton, and Markey soils, which have organic layers 16 to more than 51 inches thick
• Moderately well drained or somewhat poorly drained soils in slightly convex areas
• Areas of water
• Areas along rivers where stones, sand, and gravel are exposed

Similar inclusions:
• Soils that have a surface layer of muck, silt loam, very fine sandy loam, fine sandy loam, sandy loam, or loamy sand
• Areas of soils in which the upper part of the profile consists of alternating strata of loamy, sandy, and mucky deposits
• Soils that are sandy throughout
• Soils that have strata of gravel throughout
• Soils that have sand and gravelly sand at a depth of more than 60 inches

Soil Properties and Qualities

Drainage class: Poorly drained
Seasonal high water table: Apparent, above or near the surface
Depth class: Very deep
Permeability: Moderate or moderately rapid in the upper part and rapid or very rapid in the lower part
Available water capacity: Low or moderate
Organic matter content: High or very high
Flooding: Frequent for brief or long periods

Use and Management

Land uses: Dominant uses—woodland, habitat for wetland wildlife; other use—pasture

Woodland

Suitability: Suited
Major management concerns: Equipment limitation, windthrow hazard, plant competition, seedling mortality
Management considerations:
• Wetness and low soil strength generally limit access by machinery to the dry summer months or to periods when the soil is frozen or snow cover is thick. Reforestation is generally limited to natural regeneration or hand planting.
• Planting and harvesting operations are limited during periods of flooding. Seedling mortality may be high unless protection from flooding is provided.
• Ruts form easily on unsurfaced roads during wet periods. Log landings and haul roads can be stabilized with gravel.
• Windthrow can be minimized by using harvest methods that do not leave the remaining trees widely spaced. The periodic salvaging of windthrown trees may be needed.
• Plant competition can be controlled by mechanical site preparation or by limited use of herbicides.

• Seedling mortality can be minimized by planting vigorous nursery stock on the crest of cradle-knolls or on prepared ridges.

Wetland wildlife habitat

Suitability: Suited in undrained areas
Major management concerns: Excessive sedimentation, chemical and nutrient pollution
Management considerations:
• Undrained areas of this soil can provide wetland wildlife habitat, provide for water purification and ground-water recharge, and minimize runoff and sedimentation.
• Maintaining a saturated condition, controlling sedimentation, and following recommended nutrient and chemical management practices on adjacent land help to protect wetland areas.
• In cultivated areas, providing adjacent nesting cover can enhance the habitat.

Pasture

Suitability: Poorly suited
Major management concerns: Nutrient and pesticide loss, wetness, ponding, flooding, low strength
Management considerations:
• Providing protection from flooding, reducing chemical applications, and applying phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.
• The number of suitable forage plants is limited by the seasonal high water table.
• Establishing or maintaining an improved pasture is difficult because of the ponding and flooding.
• Low strength restricts the use of machinery.

Cropland

Suitability: Generally unsuited because of excessive wetness, ponding, frequent flooding, the severe frost hazard, and low strength

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Poor filtering capacity, wetness, ponding, flooding
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and state guidelines.

Dwellings

Suitability: Generally unsuited because of flooding and ponding

Interpretive Groups

Land capability classification: VIw
Woodland ordination symbol: 2W (silver maple)
Primary forest habitat type: Not assigned

GaA—Gastrow silt loam, 0 to 3 percent slopes

Setting

Landform: Outwash plains, glacial lake plains, and moraines
Landscape position: Linear areas, depressions, and drainageways
Shape of areas: Irregular
Size of areas: 5 to 40 acres

Representative Profile

Surface layer:
0 to 3 inches—black, friable silt loam

Subsurface layer:
3 to 5 inches—dark grayish brown, friable silt loam

Subsoil:
5 to 18 inches—brown and grayish brown, mottled, friable silt loam
18 to 29 inches—brown, mottled, friable silt loam and brown, friable silt loam
29 to 40 inches—brown, mottled, friable fine sandy loam

Substratum:
40 to 60 inches—brown, mottled, friable, stratified silt loam and very fine sand

Composition

Gastrow soil and similar inclusions: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The moderately well drained Fence soils in slightly convex areas
• Mudlake soils, which are underlain by sandy or loamy glacial till or glacial mudflow sediment
• Poorly drained soils in the lower depressions and drainageways
• Areas that have stones or boulders on the surface
• Areas of Gastrow soils that have slopes of 3 to 6 percent

Similar inclusions:
• Areas of soils in which the upper layers are loamy

sand, loamy fine sand, sandy loam, fine sandy loam, very fine sandy loam, or loam
• Soils that have a perched seasonal high water table
• Soils that have a substratum of sand, gravelly sand, or very gravelly sand

Soil Properties and Qualities

Drainage class: Somewhat poorly drained
Seasonal high water table: Apparent, 0.5 foot to 2.0 feet below the surface
Depth class: Very deep
Permeability: Moderate
Available water capacity: High
Organic matter content: Moderate in the surface layer

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other uses—cropland, pasture

Woodland

Suitability: Suited
Major management concerns: Equipment limitation, windthrow hazard, plant competition, seedling mortality
Management considerations:
• Wetness and low soil strength frequently limit access by machinery to the dry summer months or to periods when the soil is frozen or snow cover is thick.
• Ruts form easily on unsurfaced roads during wet periods. Log landings and haul roads can be stabilized with gravel.
• Windthrow can be minimized by using harvest methods that do not leave the remaining trees widely spaced. The periodic salvaging of windthrown trees may be needed.
• Plant competition can be controlled by mechanical site preparation or by limited use of herbicides.
• Seedling mortality can be minimized by planting vigorous nursery stock on the crest of cradle-knolls or on prepared ridges.

Cropland

Suitability: Well suited
Major management concerns: Wetness, poor tilth, low strength
Management considerations:
• The seasonal high water table may delay spring planting in wet years. Providing adequate drainage can improve crop production.
• Open ditches and tile drains remove excess surface water and improve internal drainage.
• Loose sand enters the tile lines unless a suitable filter covers the tile.
• Grading ditchbanks and protecting them with a plant cover help to prevent caving and erosion caused by flowing water.
• Leaving crop residue on the surface, adding other organic material to the soil, minimizing tillage, tilling and harvesting at the proper soil moisture content, and including grasses and legumes in the cropping sequence help to prevent excessive compaction, minimize crusting, and maintain good tilth.
• Low soil strength limits the use of farm equipment to periods when the soil is not wet.

Pasture

Suitability: Well suited
Major management concerns: Low strength
Management considerations:
• Low strength restricts the use of machinery.

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Restricted permeability, wetness
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and state guidelines.

Dwellings

Suitability: Poorly suited
Major management concerns: Dwellings without basements—wetness; dwellings with basements—wetness, cutbanks caving
Management considerations:
• Onsite investigation is needed.
• Installing a subsurface drainage system and adding fill material to raise the elevation of the site help to overcome the wetness.
• In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: IIw
Woodland ordination symbol: 3W (sugar maple)
Primary forest habitat type: ATD
Secondary forest habitat type: AViO or TMC

Kr—Kinross muck, 0 to 2 percent slopes

Setting

Landform: Outwash plains and stream terraces
Landscape position: Linear areas, depressions, and drainageways
Shape of areas: Irregular
Size of areas: 3 to 100 acres

Representative Profile

Surface layer:
0 to 6 inches—black, very friable muck

Subsurface layer:
6 to 19 inches—dark gray, mottled, very friable loamy sand

Subsoil:
19 to 43 inches—dark reddish brown, dark brown, and yellowish brown, mottled, very friable sand

Substratum:
43 to 60 inches—light yellowish brown, mottled, loose sand

Composition

Kinross soil and similar inclusions: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
- The somewhat poorly drained Au Gres soils in slightly convex areas
- The very poorly drained Beseman, Cathro, Dawson, and Markey soils, which have organic layers 16 to 51 inches thick

Similar inclusions:
- Areas of soils in which the upper layers are sand, loamy fine sand, sandy loam, or fine sandy loam
- Soils that have cemented layers in the subsoil
- Soils that have strata of gravel throughout
- Areas of stratified loamy and sandy deposits

Soil Properties and Qualities

Drainage class: Poorly drained
Seasonal high water table: Apparent, above or near the surface
Depth class: Very deep
Permeability: Rapid
Available water capacity: Low
Organic matter content: Very high in the surface layer

Use and Management

Land uses: Dominant uses—woodland, habitat for wetland wildlife; other use—pasture

Woodland

Suitability: Suited
Major management concerns: Equipment limitation, windthrow hazard, plant competition, seedling mortality
Management considerations:
- Wetness and low soil strength generally limit access by machinery to the dry summer months or to periods when the soil is frozen or snow cover is thick. Reforestation is generally limited to natural regeneration or hand planting.
- Ruts form easily on unsurfaced roads during wet periods. Log landings and haul roads can be stabilized with gravel.
- Windthrow can be minimized by using harvest methods that do not leave the remaining trees widely spaced. The periodic salvaging of windthrown trees may be needed.
- Plant competition can be controlled by mechanical site preparation or by limited use of herbicides.
- Seedling mortality can be minimized by planting vigorous nursery stock on the crest of cradle-knolls or on prepared ridges.

Wetland wildlife habitat

Suitability: Suited in undrained areas
Major management concerns: Excessive sedimentation, chemical and nutrient pollution
Management considerations:
- Undrained areas of this soil can provide wetland wildlife habitat, provide for water purification and ground-water recharge, and minimize runoff and sedimentation.
- Maintaining a saturated condition, controlling sedimentation, and following recommended nutrient and chemical management practices on adjacent land help to protect wetland areas.
- In cultivated areas, providing adjacent nesting cover can enhance the habitat.

Pasture

Suitability: Poorly suited
Major management concerns: Soil blowing, nutrient and pesticide loss, wetness, ponding, low strength
Management considerations:
- Establishing a high-quality cover of grasses and legumes can reduce the hazard of soil blowing.
- Overgrazing depletes the plant cover, increases the hazard of soil blowing, and increases the extent of undesirable plant species.
- Reducing chemical applications and applying nitrogen fertilizer at recommended rates can reduce leaching losses and protect the quality of ground water.
- The number of suitable forage plants is limited by the seasonal high water table.
- Establishing or maintaining an improved pasture is difficult because of the ponding.
- Low strength restricts the use of machinery. Livestock hooves cut the soil and damage the plant cover.

Cropland

Suitability: Generally unsuited because of excessive wetness, ponding, the severe frost hazard, and low strength

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Poor filtering capacity, wetness, ponding
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and state guidelines.

Dwellings without basements

Suitability: Poorly suited
Major management concerns: Wetness, ponding, soil blowing
Management considerations:
• Onsite investigation is needed.
• Providing surface drainage, installing a subsurface drainage system, and adding fill material to raise the elevation of the site help to overcome the wetness and ponding.
• Seeding and mulching exposed areas can help to control soil blowing during and after construction.

Dwellings with basements

Suitability: Generally unsuited because of ponding

Interpretive Groups

Land capability classification: VIw
Woodland ordination symbol: 2W (quaking aspen)
Primary forest habitat type: Not assigned

LaC—Laona-Sarona sandy loams, 6 to 15 percent slopes, very stony

Setting

Landform: Drumlins and moraines
Landscape position: Side slopes
Shape of areas: Irregular or long and narrow
Size of areas: 5 to 300 acres

Representative Profile

Laona

Organic layer:
0 to 2 inches—black, very friable muck

Mineral surface layer:
2 to 3 inches—brown, friable sandy loam

Subsoil:
3 to 21 inches—dark brown and brown, friable sandy loam
21 to 70 inches—brown, firm gravelly sandy loam

Substratum:
70 to 80 inches—dark yellowish brown, friable gravelly sandy loam

Sarona

Surface layer:
0 to 2 inches—black, very friable sandy loam

Subsurface layer:
2 to 4 inches—brown, very friable sandy loam

Subsoil:
4 to 29 inches—dark brown and brown, friable sandy loam
29 to 43 inches—brown, friable gravelly sandy loam

Substratum:
43 to 60 inches—dark yellowish brown, friable gravelly sandy loam

Composition

Laona soil and similar inclusions: 45 to 55 percent
Sarona soil and similar inclusions: 35 to 45 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The moderately well drained Argonne and Sarwet soils in the less sloping areas
• The well drained Padus and somewhat excessively drained Pence soils, which are underlain by sandy or sandy and gravelly glacial outwash
• Areas of wet soils in depressions
• Areas of Laona and Sarona soils that are nonstony or are bouldery
• Areas of stratified sandy, loamy, and silty deposits
• Gently sloping or moderately steep areas of Laona and Sarona soils

Similar inclusions:
• Areas of soils in which the upper layers are silt loam, loam, very fine sandy loam, fine sandy loam, or loamy sand
• Areas of soils in which the lower layers are sandy loam, loamy sand, gravelly loamy sand, cobbly loamy sand, or cobbly sandy loam

Soil Properties and Qualities

Drainage class: Well drained

Depth class: Laona—moderately deep to a fragipan; Sarona—very deep
Permeability: Laona—moderate in the upper part, slow in the fragipan, and moderate or moderately rapid in the substratum; Sarona—moderate or moderately rapid
Available water capacity: Laona—low; Sarona—moderate
Organic matter content: Laona—very high in the organic layer and moderate in the mineral surface layer; Sarona—moderately low or moderate in the surface layer
Percent of surface covered by stones: About 0.1 to 3.0

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other uses—cropland, pasture

Woodland

Suitability: Suited
Major management concerns: Laona—equipment limitation, windthrow hazard, plant competition; Sarona—equipment limitation, plant competition
Management considerations:
• The slope limits the selection of log landing sites. Landings can be established on suitable nearly level or gently sloping adjacent or included soils.
• Ruts form easily on unsurfaced roads during wet periods. Log landings and haul roads can be stabilized with gravel.
• Windthrow on the Laona soil can be minimized by using harvest methods that do not leave the remaining trees widely spaced. The periodic salvaging of windthrown trees may be needed.
• Plant competition can be controlled by mechanical site preparation or by limited use of herbicides.

Cropland

Suitability: Moderately well suited in areas where surface stones have been removed; generally unsuited in other areas
Major management concerns: Water erosion, soil blowing, droughtiness, nutrient and pesticide loss, rock fragments
Management considerations:
• A conservation tillage system that leaves crop residue on the surface, contour stripcropping, and crop rotations that include close-growing crops help to control water erosion.
• Grassed waterways, diversions, and grade-stabilization structures help to prevent gully erosion and erosion from concentrated flow.
• Field windbreaks, wind stripcropping, a cover of crop residue, and a winter cover crop reduce the hazard of soil blowing and help to prevent the damage to plants caused by windblown sand.
• Crop yields are limited during most years by the restricted available water capacity. Irrigation can improve productivity.
• Crop residue management, additions of organic material, conservation tillage, and field windbreaks increase the water-holding capacity and conserve moisture. Reducing plant populations helps to ensure adequate moisture for all plants.
• Providing protection from water erosion, reducing chemical applications, and incorporating phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.
• Some areas have stones on the surface. Unless they are removed, the stones interfere with tillage.

Pasture

Suitability: Moderately well suited
Major management concerns: Laona—water erosion, soil blowing, droughtiness, nutrient and pesticide loss, rock fragments; Sarona—water erosion, soil blowing, nutrient and pesticide loss, rock fragments
Management considerations:
• Establishing a high-quality cover of grasses and legumes can reduce the hazard of soil blowing.
• Overgrazing depletes the plant cover, increases the hazard of soil blowing, and increases the extent of undesirable plant species.
• Forage yields on the Laona soil are limited during most years by the restricted available water capacity. Drought-tolerant species are best suited to this soil.
• Restricting grazing during dry periods helps to maintain a high-quality cover of pasture plants.
• Reducing chemical applications and applying phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.
• Surface stones may interfere with the use of machinery.

Septic tank absorption fields

Severity of soil limitations: Laona—severe; Sarona—moderate
Major restrictive features: Restricted permeability, slope
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and state guidelines.

Dwellings

Suitability: Moderately well suited
Major management concerns: Slope, water erosion, soil blowing, cutbanks caving
Management considerations:
• Onsite investigation is needed.
• Buildings can be designed so that they conform to the natural slope of the land. The slope can be modified by cutting and filling.
• Seeding and mulching exposed areas can help to control water erosion and soil blowing during and after construction.
• In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: VIs in very stony areas; IIIe in nonstony areas
Woodland ordination symbol: 3L (sugar maple)
Primary forest habitat type: ATD
Secondary forest habitat types: AQVib or AViO

LaD—Laona-Sarona sandy loams, 15 to 35 percent slopes, very stony

Setting

Landform: Drumlins and moraines
Landscape position: Side slopes
Shape of areas: Irregular or long and narrow
Size of areas: 5 to 250 acres

Representative Profile

Laona

Surface layer:
0 to 5 inches—dark brown, very friable sandy loam

Subsurface layer:
5 to 8 inches—brown, very friable sandy loam

Subsoil:
8 to 28 inches—brown and strong brown, very friable sandy loam
28 to 35 inches—strong brown and brown, friable sandy loam
35 to 42 inches—brown, firm gravelly sandy loam
42 to 47 inches—brown, friable gravelly loamy sand

Substratum:
47 to 60 inches—brown, friable gravelly loamy sand

Sarona

Surface layer:
0 to 1 inch—very dark gray, very friable sandy loam

Subsurface layer:
1 to 3 inches—brown, very friable sandy loam

Subsoil:
3 to 22 inches—dark brown and brown, very friable sandy loam
22 to 38 inches—brown, friable gravelly loamy sand and strong brown, friable gravelly sandy loam
38 to 56 inches—strong brown, friable gravelly sandy loam and brown, friable and very friable gravelly loamy sand

Substratum:
56 to 60 inches—brown, very friable gravelly loamy sand

Composition

Laona soil and similar inclusions: 45 to 55 percent
Sarona soil and similar inclusions: 35 to 45 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The well drained Padus and somewhat excessively drained Pence soils, which are underlain by sandy or sandy and gravelly glacial outwash
• Areas of wet soils in depressions
• Areas of stratified sandy, loamy, and silty deposits
• Areas of Laona and Sarona soils that are nonstony or are bouldery
• Gently sloping, sloping, or very steep areas of Laona and Sarona soils

Similar inclusions:
• Areas of soils in which the upper layers are silt loam, loam, very fine sandy loam, fine sandy loam, or loamy sand
• Areas of soils in which the lower layers are loamy sand, sandy loam, cobbly loamy sand, or cobbly sandy loam

Soil Properties and Qualities

Drainage class: Well drained
Depth class: Laona—moderately deep to a fragipan; Sarona—very deep
Permeability: Laona—moderate in the upper part, slow in the fragipan, and moderate or moderately rapid in the substratum; Sarona—moderate or moderately rapid

Available water capacity: Laona—low; Sarona—moderate
Organic matter content: Laona—moderate in the surface layer; Sarona—moderately low or moderate in the surface layer
Percent of surface covered by stones: About 0.1 to 3.0

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other use—pasture

Woodland

Suitability: Suited
Major management concerns: Laona—equipment limitation, erosion hazard, windthrow hazard, plant competition; Sarona—equipment limitation, erosion hazard, plant competition
Management considerations:
• The slope limits the selection of log landing sites. Landings can be established on suitable nearly level or gently sloping adjacent or included soils.
• Because the slope limits the use of conventional equipment, special harvesting and planting methods, such as yarding the logs by cable and planting seedlings by hand, may be needed.
• Carefully locating skid trails and building haul roads on the contour reduce the hazard of erosion and minimize equipment limitations.
• Ruts form easily on unsurfaced roads during wet periods. Log landings and haul roads can be stabilized with gravel.
• Seeding and mulching exposed areas after logging, sloping road surfaces to remove runoff water, and installing water bars, culverts, and drop structures can reduce the hazard of erosion.
• Windthrow on the Laona soil can be minimized by using harvest methods that do not leave the remaining trees widely spaced. The periodic salvaging of windthrown trees may be needed.
• Plant competition can be controlled by mechanical site preparation or by limited use of herbicides.

Pasture

Suitability: Poorly suited
Major management concerns: Laona—water erosion, soil blowing, droughtiness, nutrient and pesticide loss, rock fragments; Sarona—water erosion, soil blowing, nutrient and pesticide loss, rock fragments
Management considerations:
• The steeper areas are generally limited to pasture of existing forage species. Maintaining a high-quality cover of pasture plants can reduce the hazards of water erosion and soil blowing.
• Overgrazing depletes the plant cover, increases the hazards of water erosion and soil blowing, and increases the extent of undesirable plant species.
• Forage yields on the Laona soil are limited during most years by the restricted available water capacity. Drought-tolerant species are best suited to this soil.
• Restricting grazing during dry periods helps to maintain a high-quality cover of pasture plants.
• Reducing chemical applications and applying phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.
• Surface stones may interfere with the use of machinery.

Cropland

Suitability: Generally unsuited because of surface stones, the slope, and the very severe hazard of water erosion

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Restricted permeability, slope
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and state guidelines.

Dwellings

Suitability: Poorly suited in the less sloping areas; generally unsuited in other areas
Major management concerns: Slope, water erosion, soil blowing, cutbanks caving
Management considerations:
• Onsite investigation is needed.
• In the less sloping areas, buildings can be designed so that they conform to the natural slope of the land. The slope can be modified by cutting and filling.
• Seeding and mulching exposed areas can help to control water erosion and soil blowing during and after construction.
• In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: VIIe in very stony areas; VIe in nonstony areas
Woodland ordination symbol: 3R (sugar maple)
Primary forest habitat type: ATD
Secondary forest habitat types: AQVib or AViO

Lo—Loxley, Beseman, and Dawson peats, 0 to 1 percent slopes

Setting

Landform: Outwash plains, glacial lake plains, and moraines
Landscape position: Depressions and basins (fig. 7)
Shape of areas: Round, irregular, or long and narrow
Size of areas: 5 to 1,500 acres

Representative Profile

Loxley

Surface layer:
0 to 12 inches—dark yellowish brown, very friable peat

Lower tiers:
12 to 60 inches—black, friable muck

Beseman

Surface layer:
0 to 12 inches—dark brown, very friable peat

Lower tiers:
12 to 36 inches—dark reddish brown and black, friable muck

Substratum:
36 to 60 inches—dark gray, friable silt loam

Dawson

Surface layer:
0 to 10 inches—dark reddish brown, very friable peat



Figure 7.—A typical bog area of Loxley, Beseman, and Dawson peats, 0 to 1 percent slopes. Drumlins are in the background.

Lower tiers:
10 to 44 inches—dark reddish brown, very friable muck

Substratum:
44 to 60 inches—brown, loose sand

Composition

Loxley, Beseman, and Dawson soils: Variable
Contrasting inclusions: 10 to 25 percent

Inclusions

Contrasting inclusions:
- Areas in which the soils are less acid than the major soils and support trees of merchantable size and quality
- Areas of poorly drained to excessively drained soils in the higher landscape positions
- Areas of water
- Areas that are inundated throughout most of the year

Similar inclusions:
- Soils that have a surface layer of muck or mucky peat
- Areas of Beseman soils that have a substratum of sandy loam, gravelly sandy loam, fine sandy loam, or loam
- Areas of Dawson soils that have a substratum of fine sand, loamy fine sand, loamy sand, gravelly loamy sand, or gravelly sand

Soil Properties and Qualities

Drainage class: Very poorly drained
Seasonal high water table: Apparent, above or near the surface
Depth class: Very deep
Permeability: Loxley—moderately slow to moderately rapid; Beseman—moderate or moderately rapid in the organic material and moderately slow in the substratum; Dawson—moderately slow to rapid in the organic material and rapid in the substratum
Available water capacity: Very high
Organic matter content: Very high in the surface layer

Use and Management

Land uses: Dominant use—wetland wildlife habitat

Wetland wildlife habitat

Suitability: Suited in undrained areas
Major management concerns: Excessive sedimentation, chemical and nutrient pollution
Management considerations:
- Undrained areas of these soils can provide wetland wildlife habitat, provide for water purification and ground-water recharge, and minimize runoff and sedimentation.
- Maintaining a saturated condition, controlling sedimentation, and following recommended nutrient and chemical management practices on adjacent land help to protect wetland areas.
- In cultivated areas, providing adjacent nesting cover can enhance the habitat.

Woodland

Suitability: Generally unsuited because of excessive wetness, ponding, extreme acidity, and low strength (these soils do not support trees of merchantable size or quality)

Cropland or pasture

Suitability: Generally unsuited because of excessive wetness, ponding, a scarcity of suitable drainage outlets, extreme acidity, the severe frost hazard, and low strength

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Restricted permeability, wetness, ponding, subsidence
Management considerations:
- Onsite investigation is needed. The design of absorption fields should meet local and state guidelines.

Dwellings

Suitability: Generally unsuited because of wetness, ponding, low strength, and subsidence

Interpretive Groups

Land capability classification: VIIw
Woodland ordination symbol: Not assigned
Primary forest habitat type: Not assigned

Lu—Lupton, Cathro, and Markey mucks, 0 to 1 percent slopes

Setting

Landform: Outwash plains, glacial lake plains, and moraines
Landscape position: Depressions and drainageways
Shape of areas: Round, irregular, or long and narrow
Size of areas: 5 to 1,500 acres

Representative Profile

Lupton

Surface layer:
0 to 10 inches—black, very friable muck

Lower tiers:
10 to 60 inches—black, very friable muck

Cathro

Surface layer:
0 to 8 inches—black, very friable muck

Lower tiers:
8 to 30 inches—black, very friable muck

Substratum:
30 to 37 inches—gray, friable silt loam
37 to 60 inches—grayish brown and brown, mottled, friable sandy loam

Markey

Surface layer:
0 to 17 inches—black, very friable muck

Lower tiers:
17 to 21 inches—black, very friable mucky peat
21 to 36 inches—black, friable muck

Substratum:
36 to 60 inches—grayish brown, loose sand

Composition

Lupton, Cathro, and Markey soils: Variable
Contrasting inclusions: 10 to 25 percent

Inclusions

Contrasting inclusions:
- The poorly drained Fordum soils, which formed primarily in loamy alluvium underlain by sandy or sandy and gravelly deposits; on flood plains
- Areas in which the soils are more acid than the major soils and do not support trees of merchantable size and quality
- Areas of poorly drained to excessively drained soils in the higher landscape positions
- Areas of water
- Areas that are inundated throughout most of the year
- Soils that have stones or boulders on the surface

Similar inclusions:
- Soils that have a surface layer of mucky peat or peat
- Areas of Markey soils that have a substratum of gravelly sand, fine sand, loamy sand, gravelly loamy sand, or loamy fine sand
- Areas of Cathro soils that have a substratum of fine sandy loam, very fine sandy loam, or loam

Soil Properties and Qualities

Drainage class: Very poorly drained
Seasonal high water table: Apparent, above or near the surface
Depth class: Very deep
Permeability: Lupton—moderately slow to moderately rapid; Cathro—moderately slow to moderately rapid in the organic material and moderately slow or moderate in the substratum; Markey—moderately slow to moderately rapid in the organic material and very rapid in the substratum
Available water capacity: Very high
Organic matter content: Very high in the surface layer

Use and Management

Land uses: Dominant uses—woodland, habitat for wetland wildlife; other use—pasture

Woodland

Suitability: Suited
Major management concerns: Equipment limitation, windthrow hazard, plant competition, seedling mortality
Management considerations:
- Wetness and low soil strength generally limit access by machinery to periods when the soil is frozen or snow cover is thick. Reforestation is generally limited to natural regeneration.
- Windthrow can be minimized by using harvest methods that do not leave the remaining trees widely spaced. The periodic salvaging of windthrown trees may be needed.
- Plant competition can be controlled by mechanical site preparation or by limited use of herbicides.

Wetland wildlife habitat

Suitability: Suited in undrained areas
Major management concerns: Excessive sedimentation, chemical and nutrient pollution
Management considerations:
- Undrained areas of these soils can provide wetland wildlife habitat, provide for water purification and ground-water recharge, and minimize runoff and sedimentation.
- Maintaining a saturated condition, controlling sedimentation, and following recommended nutrient and chemical management practices on adjacent land help to protect wetland areas.
- In cultivated areas, providing adjacent nesting cover can enhance the habitat.

Cropland

Suitability: Generally unsuited because of excessive wetness, ponding, a scarcity of suitable drainage outlets, the severe frost hazard, and low strength

Pasture

Suitability: Poorly suited
Major management concerns: Soil blowing, nutrient and pesticide loss, wetness, ponding, low strength
Management considerations:
• Establishing a high-quality cover of grasses and legumes can reduce the hazard of soil blowing.
• Overgrazing depletes the plant cover, increases the hazard of soil blowing, and increases the extent of undesirable plant species.
• Reducing chemical applications and applying nitrogen fertilizer at recommended rates can reduce leaching losses and protect the quality of ground water.
• The number of suitable forage plants is limited by the seasonal high water table.
• Establishing or maintaining an improved pasture is difficult because of the ponding.
• Low strength restricts the use of machinery. Livestock hooves cut the soil and damage the plant cover.

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Lupton—restricted permeability, wetness, ponding, subsidence; Cathro—restricted permeability, wetness, ponding; Markey—poor filtering capacity, restricted permeability, wetness, ponding, subsidence
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and state guidelines.

Dwellings

Suitability: Generally unsuited because of wetness, ponding, subsidence, and low strength

Interpretive Groups

Land capability classification: VIw
Woodland ordination symbol: Lupton—6W (balsam fir); Cathro—5W (balsam fir); Markey—7W (balsam fir)
Primary forest habitat type: Not assigned

M-W—Miscellaneous water

Setting

Landform: Mostly outwash plains, drumlins, and moraines
Shape of areas: Rectangular or irregular
Size of areas: 5 to 15 acres

General Description

• This map unit occurs as small manmade areas of water and spoil consisting of excavated soil material. Typically, these areas contain water most of the year. The spoil is partially revegetated with grasses and weeds.

Composition

Miscellaneous water and similar inclusions: 95 to 100 percent
Contrasting inclusions: 0 to 5 percent

Inclusions

Contrasting inclusions:
• Access roads and walkways

Similar inclusions:
• Areas of sandy, loamy, or silty soil material between areas of the excavated spoil material

Use and Management

Land uses: Dominant use—industrial, sanitary, or mining applications; other use—wetland wildlife habitat

Interpretive Groups

Land capability classification: Not assigned
Woodland ordination symbol: Not assigned
Primary forest habitat type: Not assigned

MaA—Manitowish sandy loam, 0 to 3 percent slopes

Setting

Landform: Outwash plains and stream terraces
Landscape position: Linear areas, toeslopes, and footslopes
Shape of areas: Irregular
Size of areas: 5 to 100 acres

Representative Profile

Surface layer:
0 to 2 inches—black, very friable sandy loam

Subsurface layer:
2 to 4 inches—brown, very friable sandy loam

Subsoil:
4 to 16 inches—brown, very friable sandy loam
16 to 22 inches—strong brown, very friable loamy sand

Substratum:
22 to 32 inches—brown, loose, stratified sand and gravelly coarse sand
32 to 60 inches—brown, mottled, loose, stratified sand and gravelly coarse sand

Composition

Manitowish soil and similar inclusions: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The well drained Padus and Tipler soils, which are deeper to sandy or sandy and gravelly glacial outwash than the Manitowish soil
• The somewhat excessively drained Pence soils in slightly convex areas
• The somewhat poorly drained Wormet soils in depressions and drainageways
• Areas of Manitowish soils that have slopes of 3 to 6 percent
• Areas that have stones or boulders on the surface
• Areas of stratified sandy, loamy, and silty deposits

Similar inclusions:
• Areas of soils in which the upper layers are loam, fine sandy loam, or loamy sand
• Soils that have a substratum of sand

Soil Properties and Qualities

Drainage class: Moderately well drained
Seasonal high water table: Apparent, 2.5 to 3.5 feet below the surface
Depth class: Very deep
Permeability: Moderate or moderately rapid in the upper part and rapid or very rapid in the lower part
Available water capacity: Low
Organic matter content: Moderately low or moderate in the surface layer

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other uses—cropland, pasture

Woodland

Suitability: Suited
Major management concerns: Plant competition
Management considerations:
• Plant competition can be controlled by mechanical site preparation or by limited use of herbicides.

Cropland

Suitability: Moderately well suited
Major management concerns: Soil blowing, droughtiness, nutrient and pesticide loss
Management considerations:
• Field windbreaks, wind stripcropping, a cover of crop residue, and a winter cover crop reduce the hazard of soil blowing and help to prevent the damage to plants caused by windblown sand.
• Crop yields are limited during most years by the restricted available water capacity. Irrigation can improve productivity.
• Crop residue management, additions of organic material, conservation tillage, and field windbreaks increase the water-holding capacity and conserve moisture. Reducing plant populations helps to ensure adequate moisture for all plants.
• Reducing chemical applications and providing split applications of nitrogen fertilizer at recommended rates during the growing season can reduce leaching losses and protect the quality of ground water.
• The proper scheduling of irrigation can minimize the leaching of plant nutrients and other chemicals out of the root zone and into the underlying ground water.

Pasture

Suitability: Well suited
Major management concerns: Soil blowing, droughtiness, nutrient and pesticide loss
Management considerations:
• Establishing a high-quality cover of grasses and legumes can reduce the hazard of soil blowing.
• Overgrazing depletes the plant cover, increases the hazard of soil blowing, and increases the extent of undesirable plant species.
• Forage yields are limited during most years by the restricted available water capacity. Drought-tolerant species are best suited to this soil.
• Restricting grazing during dry periods helps to maintain a high-quality cover of pasture plants.
• Reducing chemical applications and applying nitrogen fertilizer at recommended rates can reduce leaching losses and protect the quality of ground water.

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Poor filtering capacity, wetness
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and state guidelines.

Dwellings without basements

Suitability: Well suited

Major management concerns: Soil blowing
Management considerations:
• Onsite investigation is needed.
• Seeding and mulching exposed areas can help to control soil blowing during and after construction.

Dwellings with basements

Suitability: Moderately well suited
Major management concerns: Wetness, soil blowing, cutbanks caving
Management considerations:
• Onsite investigation is needed.
• Installing a subsurface drainage system and adding fill material to raise the elevation of the site help to overcome the wetness.
• Seeding and mulching exposed areas can help to control soil blowing during and after construction.
• In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: IIIs
Woodland ordination symbol: 3A (sugar maple)
Primary forest habitat type: ATM
Secondary forest habitat type: TMC

MeD—Metonga-Rock outcrop complex, 4 to 60 percent slopes, very stony

Setting

Landform: Moraines
Landscape position: Convex summits and side slopes
Shape of areas: Irregular or elongated
Size of areas: 20 to 300 acres

Representative Profile

Metonga

Surface layer:
0 to 3 inches—black, very friable very fine sandy loam

Subsurface layer:
3 to 4 inches—brown, very friable very fine sandy loam

Subsoil:
4 to 25 inches—dark brown, very friable very fine sandy loam and brown, very friable and friable very fine sandy loam
25 to 28 inches—reddish brown, friable sandy loam

Bedrock:
28 inches—granite

Rock outcrop

Type of material: Exposed granite bedrock

Composition

Metonga soil and similar inclusions: 50 to 80 percent
Rock outcrop: 15 to 25 percent
Contrasting inclusions: 5 to 25 percent

Inclusions

Contrasting inclusions:
• The moderately well drained Argonne, Sarwet, Wabeno, Laona, Sarona, and Soperton soils, which are not underlain by bedrock within a depth of 60 inches
• Padus soils and the somewhat excessively drained Pence soils, which are underlain by sandy or sandy and gravelly glacial outwash
• Areas of stratified sandy, loamy, and silty deposits
• Areas of nearly vertical bedrock escarpments
• Areas of Metonga soils that are nonstony or are bouldery
• Areas of wet soils in depressions

Similar inclusions:
• Soils that have bedrock at a depth of less than 20 inches or at a depth of 40 to 60 inches
• Soils that have slopes of 1 to 4 percent
• Areas in which the bedrock consists of metamorphic rock
• Areas of soils in which the upper layers are loamy sand, sandy loam, fine sandy loam, loam, or silt loam
• Soils in which the lower part of the subsoil is loamy sand, gravelly loamy sand, gravelly sandy loam, channery or very channery sandy loam, channery or very channery loamy sand, flaggy or very flaggy sandy loam, or flaggy or very flaggy loamy sand

Soil Properties and Qualities

Drainage class: Metonga—well drained
Depth class: Metonga—moderately deep to hard igneous or metamorphic bedrock
Permeability: Metonga—moderate in the solum and very slow to rapid in the underlying material
Available water capacity: Metonga—low
Organic matter content: Metonga—moderately low or moderate in the surface layer
Percent of surface covered by stones: Metonga—about 0.1 to 3.0

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other use—pasture

Woodland

Suitability: Metonga—suited; Rock outcrop—generally unsuited
Major management concerns: Metonga—equipment limitation, erosion hazard, windthrow hazard, plant competition
Management considerations:
• In areas of the Metonga soil that have slopes of more than about 6 percent, the selection of log landing sites is limited. Landings can be established on suitable nearly level or gently sloping adjacent or included soils.
• Because the use of conventional equipment is limited in areas of the Metonga soil that have slopes of more than about 15 percent, special harvesting and planting methods, such as yarding the logs by cable and planting seedlings by hand, may be needed.
• Carefully locating skid trails and building haul roads on the contour reduce the hazard of erosion and minimize equipment limitations.
• Hard bedrock limits the depth of cuts and interferes with the construction of haul roads and log landings in areas of the Metonga soil.
• Bedrock outcrops and escarpments severely restrict the movement of logging equipment. The careful location of logging roads is necessary.
• In areas of the Metonga soil, ruts form easily on unsurfaced roads during wet periods. Log landings and haul roads can be stabilized with gravel.
• Seeding and mulching exposed areas after logging, sloping road surfaces to remove runoff water, and installing water bars, culverts, and drop structures can reduce the hazard of erosion in areas of the Metonga soil.
• Windthrow on the Metonga soil can be minimized by using harvest methods that do not leave the remaining trees widely spaced. The periodic salvaging of windthrown trees may be needed.
• Plant competition on the Metonga soil can be controlled by mechanical site preparation or by limited use of herbicides.

Pasture

Suitability: Metonga—poorly suited; Rock outcrop—unsuited
Major management concerns: Metonga—water erosion, soil blowing, droughtiness, nutrient and pesticide loss, rock fragments
Management considerations:
• The steeper areas of the Metonga soil are generally limited to pasture of existing forage species. Maintaining a high-quality cover of pasture plants can reduce the hazards of water erosion and soil blowing.
• Overgrazing depletes the plant cover, increases the hazards of water erosion and soil blowing, and increases the extent of undesirable plant species.
• Forage yields on the Metonga soil are limited during most years by the restricted available water capacity. Drought-tolerant species are best suited to this soil.
• Restricting grazing during dry periods helps to maintain a high-quality cover of pasture plants.
• Reducing chemical applications and applying phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.
• Surface stones and the areas of Rock outcrop may interfere with the use of machinery.

Cropland

Suitability: Generally unsuited because of the slope, the very severe hazard of water erosion, and the Rock outcrop

Septic tank absorption fields

Severity of soil limitations or suitability: Metonga—severe; Rock outcrop—unsuited
Major restrictive features: Metonga—restricted permeability, slope, depth to rock
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and state guidelines.

Dwellings

Suitability: Metonga—poorly suited in the less sloping areas and generally unsuited in other areas; Rock outcrop—unsuited
Major management concerns: Metonga—slope, depth to rock, water erosion, soil blowing
Management considerations:
• In the less sloping areas of the Metonga soil, buildings can be designed so that they conform to the natural slope of the land. The slope can be modified by cutting and filling. The underlying hard bedrock, however, limits the depth of cuts. The bedrock can be excavated by blasting or by using suitable power equipment.
• Seeding and mulching exposed areas can help to control water erosion and soil blowing during and after construction.

Interpretive Groups

Land capability classification: VIIIs
Woodland ordination symbol: Metonga—3R (sugar maple); Rock outcrop—not assigned
Primary forest habitat type: ATD

Mn—Minocqua muck, 0 to 2 percent slopes

Setting

Landform: Outwash plains and stream terraces
Landscape position: Linear areas, depressions, and drainageways
Shape of areas: Irregular or long and narrow
Size of areas: 5 to 30 acres

Representative Profile

Surface layer:
0 to 4 inches—black, very friable muck

Subsurface layer:
4 to 15 inches—dark gray and grayish brown, mottled, friable silt loam

Subsoil:
15 to 28 inches—dark grayish brown, mottled, friable loam

Substratum:
28 to 38 inches—brown, mottled, loose sand and gravelly sand
38 to 60 inches—brown, loose very gravelly sand

Composition

Minocqua soil and similar inclusions: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The very poorly drained Cathro, Lupton, and Markey soils, which have organic layers 16 to more than 51 inches thick
• The somewhat poorly drained Whisklake, Worcester, and Wormet soils in the slightly higher landscape positions
• Areas that have stones or boulders on the surface

Similar inclusions:
• Areas of soils in which the upper layers are fine sandy loam, sandy loam, or loamy sand
• Soils that have sandy or sandy and gravelly outwash at a depth of less than 20 inches or more than 40 inches
• Areas of stratified sandy, loamy, and silty deposits

Soil Properties and Qualities

Drainage class: Poorly drained
Seasonal high water table: Apparent, above or near the surface
Depth class: Very deep
Permeability: Moderate in the upper part and rapid or very rapid in the lower part
Available water capacity: Low or moderate
Organic matter content: Very high in the surface layer

Use and Management

Land uses: Dominant uses—woodland, habitat for wetland wildlife; other use—pasture

Woodland

Suitability: Suited
Major management concerns: Equipment limitation, windthrow hazard, plant competition, seedling mortality
Management considerations:
• Wetness and low soil strength generally limit access by machinery to the dry summer months or to periods when the soil is frozen or snow cover is thick. Reforestation is generally limited to natural regeneration or hand planting.
• Ruts form easily on unsurfaced roads during wet periods. Log landings and haul roads can be stabilized with gravel.
• Windthrow can be minimized by using harvest methods that do not leave the remaining trees widely spaced. The periodic salvaging of windthrown trees may be needed.
• Plant competition can be controlled by mechanical site preparation or by limited use of herbicides.
• Seedling mortality can be minimized by planting vigorous nursery stock on the crest of cradle-knolls or on prepared ridges.

Wetland wildlife habitat

Suitability: Suited in undrained areas
Major management concerns: Excessive sedimentation, chemical and nutrient pollution
Management considerations:
• Undrained areas of this soil can provide wetland wildlife habitat, provide for water purification and ground-water recharge, and minimize runoff and sedimentation.
• Maintaining a saturated condition, controlling sedimentation, and following recommended nutrient and chemical management practices on adjacent land help to protect wetland areas.
• In cultivated areas, providing adjacent nesting cover can enhance the habitat.

Pasture

Suitability: Poorly suited
Major management concerns: Soil blowing, wetness, ponding, low strength
Management considerations:
• Establishing a high-quality cover of grasses and legumes can reduce the hazard of soil blowing.

• Overgrazing depletes the plant cover, increases the hazard of soil blowing, and increases the extent of undesirable plant species.
• The number of suitable forage plants is limited by the seasonal high water table.
• Establishing or maintaining an improved pasture is difficult because of the ponding.
• Low strength restricts the use of machinery. Livestock hooves cut the soil and damage the plant cover.

Cropland

Suitability: Generally unsuited because of excessive wetness, ponding, the severe frost hazard, and low strength

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Poor filtering capacity, wetness, ponding
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and state guidelines.

Dwellings without basements

Suitability: Poorly suited
Major management concerns: Wetness, ponding, soil blowing
Management considerations:
• Onsite investigation is needed.
• Providing surface drainage, installing a subsurface drainage system, and adding fill material to raise the elevation of the site help to overcome the wetness and ponding.
• Seeding and mulching exposed areas can help to control soil blowing during and after construction.

Dwellings with basements

Suitability: Generally unsuited because of ponding

Interpretive Groups

Land capability classification: VIw
Woodland ordination symbol: 7W (balsam fir)
Primary forest habitat type: Not assigned

MuB—Mudlake silt loam, 1 to 6 percent slopes, very stony

Setting

Landform: Drumlins and moraines
Landscape position: Depressions, drainageways, toeslopes, and footslopes
Shape of areas: Irregular or long and narrow
Size of areas: 5 to 250 acres

Representative Profile

Surface layer:
0 to 5 inches—dark brown, friable silt loam

Subsurface layer:
5 to 9 inches—brown, mottled, friable silt loam

Subsoil:
9 to 29 inches—brown, mottled, friable silt loam
29 to 35 inches—brown, mottled, friable sandy loam

Substratum:
35 to 60 inches—brown, friable loamy sand

Composition

Mudlake soil and similar inclusions: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The moderately well drained Argonne, Goodwit, Sarwet, and Wabeno soils in slightly convex areas
• The poorly drained Capitola soils in the lower depressions and drainageways
• Gastrow soils, which are underlain by stratified lacustrine deposits
• Areas of Mudlake soils that are nonstony or are bouldery
• Areas of Mudlake soils that have slopes of 6 to 10 percent

Similar inclusions:
• Areas of soils in which the upper layers are loam, very fine sandy loam, fine sandy loam, or sandy loam
• Soils that have an apparent seasonal high water table
• Areas of soils in which the lower layers are gravelly sandy loam, gravelly loamy sand, cobbly sandy loam, or cobbly loamy sand
• Soils that have a substratum of sandy loam

Soil Properties and Qualities

Drainage class: Somewhat poorly drained
Seasonal high water table: Perched, 0.5 foot to 2.0 feet below the surface
Depth class: Very deep
Permeability: Moderate in the upper part and moderate or moderately rapid in the lower part
Available water capacity: Moderate or high
Organic matter content: Moderate in the surface layer
Percent of surface covered by stones: About 0.1 to 3.0

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other uses—cropland, pasture

Woodland

Suitability: Suited
Major management concerns: Equipment limitation, windthrow hazard, plant competition, seedling mortality
Management considerations:
• Wetness and low soil strength frequently limit access by machinery to the dry summer months or to periods when the soil is frozen or snow cover is thick.
• Ruts form easily on unsurfaced roads during wet periods. Log landings and haul roads can be stabilized with gravel.
• Windthrow can be minimized by using harvest methods that do not leave the remaining trees widely spaced. The periodic salvaging of windthrown trees may be needed.
• Plant competition can be controlled by mechanical site preparation or by limited use of herbicides.
• Seedling mortality can be minimized by planting vigorous nursery stock on the crest of cradle-knolls or on prepared ridges.

Cropland

Suitability: Well suited in areas where surface stones have been removed; poorly suited in other areas
Major management concerns: Water erosion, droughtiness, nutrient and pesticide loss, wetness, poor tilth, rock fragments, low strength
Management considerations:
• A conservation tillage system that leaves crop residue on the surface, contour stripcropping, and crop rotations that include close-growing crops help to control water erosion in the more sloping areas.
• Grassed waterways, diversions, and grade-stabilization structures help to prevent gully erosion and erosion from concentrated flow.
• If the water table is lowered, crop yields are somewhat limited during dry years in areas where the available water capacity of the soil is restricted.
• Crop residue management, additions of organic material, conservation tillage, and field windbreaks increase the water-holding capacity and conserve moisture. Reducing plant populations helps to ensure adequate moisture for all plants.
• Providing protection from water erosion, reducing chemical applications, and incorporating phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.
• The seasonal high water table may delay spring planting in wet years. Providing adequate drainage can improve crop production.
• Open ditches and tile drains remove excess surface water and improve internal drainage.
• Loose sand enters the tile lines unless a suitable filter covers the tile.
• Grading ditchbanks and protecting them with a plant cover help to prevent caving and erosion caused by flowing water.
• Leaving crop residue on the surface, adding other organic material to the soil, minimizing tillage, tilling and harvesting at the proper soil moisture content, and including grasses and legumes in the cropping sequence help to prevent excessive compaction, minimize crusting, and maintain good tilth.
• Some areas have stones on the surface. Unless they are removed, the stones interfere with tillage.
• Low soil strength limits the use of farm equipment to periods when the soil is not wet.

Pasture

Suitability: Moderately well suited
Major management concerns: Rock fragments, low strength
Management considerations:
• Surface stones may interfere with the use of machinery.
• Low strength restricts the use of machinery.

Septic tank aborption fields

Severity of soil limitations: Severe
Major restrictive features: Restricted permeability, wetness
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and state guidelines.

Dwellings

Suitability: Poorly suited
Major management concerns: Dwellings without basements—wetness, water erosion; dwellings with basements—wetness, water erosion, cutbanks caving
Management considerations:
• Onsite investigation is needed.
• Installing a subsurface drainage system and adding fill material to raise the elevation of the site help to overcome the wetness.
• Seeding and mulching exposed areas can help to control water erosion during and after construction.
• In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: IVs in very stony areas; IIe in nonstony areas (fig. 8)
Woodland ordination symbol: 3W (red maple)
Primary forest habitat type: ATD
Secondary forest habitat type: AViO or TMC

PaB—Padus sandy loam, 0 to 6 percent slopes

Setting

Landform: Outwash plains, stream terraces, eskers, and kames
Landscape position: Toeslopes, side slopes, and linear and slightly convex summits
Shape of areas: Irregular
Size of areas: 5 to 200 acres

Representative Profile

Surface layer:
0 to 2 inches—dark brown, friable sandy loam

Subsurface layer:
2 to 4 inches—reddish gray, very friable sandy loam

Subsoil:
4 to 10 inches—dark brown, very friable sandy loam
10 to 25 inches—brown, friable sandy loam

Substratum:
25 to 60 inches—strong brown, loose, stratified sand and gravelly sand

Composition

Padus soil and similar inclusions: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The moderately well drained Manitowish and somewhat excessively drained Pence soils, which have thinner loamy deposits than those of the Padus soil



Figure 8.—A pasture in an area of Mudlake silt loam, 1 to 6 percent slopes, very stony. In areas where the stones have been removed (foreground), the land capability classification of this soil is IIe.

- The moderately well drained Tipler soils
- The somewhat poorly drained Worcester soils in depressions
- Areas of stratified sandy, loamy, and silty deposits
- Areas that have stones or boulders on the surface
- Soils in which the substratum has pockets of sandy loam, loamy sand, gravelly sandy loam, or gravelly loamy sand
- Sloping areas of Padus soils

Similar inclusions:
- Areas of soils in which the upper layers are silt loam, loam, very fine sandy loam, fine sandy loam, or loamy sand
- Soils that have a substratum of sand, coarse sand, gravelly sand, gravelly coarse sand, very gravelly sand, or very gravelly coarse sand
- Soils in which the substratum is at a depth of more than 40 inches
- Soils that are eroded

Soil Properties and Qualities

Drainage class: Well drained
Depth class: Very deep
Permeability: Moderate in the solum and rapid or very rapid in the substratum
Available water capacity: Low or moderate
Organic matter content: Moderately low or moderate in the surface layer

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other uses—cropland, pasture

Woodland

Suitability: Suited
Major management concerns: Equipment limitation, plant competition
Management considerations:
- Ruts form easily on unsurfaced roads during wet periods. Log landings and haul roads can be stabilized with gravel.
- Plant competition can be controlled by mechanical site preparation or by limited use of herbicides.

Cropland

Suitability: Well suited
Major management concerns: Water erosion, soil blowing, droughtiness, nutrient and pesticide loss
Management considerations:
- A conservation tillage system that leaves crop residue on the surface, contour stripcropping, and crop rotations that include close-growing crops help to control water erosion in the more sloping areas.
- Grassed waterways, diversions, and grade-stabilization structures help to prevent gully erosion and erosion from concentrated flow.
- Field windbreaks, wind stripcropping, a cover of crop residue, and a winter cover crop reduce the hazard of soil blowing and help to prevent the damage to plants caused by windblown sand.
- Crop yields are limited during most years by the restricted available water capacity. Irrigation can improve productivity.
- Crop residue management, additions of organic material, conservation tillage, and field windbreaks increase the water-holding capacity and conserve moisture. Reducing plant populations helps to ensure adequate moisture for all plants.
- Providing protection from water erosion, reducing chemical applications, and incorporating phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.

Pasture

Suitability: Well suited
Major management concerns: Water erosion, soil blowing, droughtiness, nutrient and pesticide loss
Management considerations:
- Establishing a high-quality cover of grasses and legumes can reduce the hazard of water erosion and soil blowing.
- Overgrazing depletes the plant cover, increases the hazards of water erosion and soil blowing, and increases the extent of undesirable plant species.
- Forage yields are limited during most years in areas where the available water capacity of the soil is low. Drought-tolerant species are best suited to this soil.
- Restricting grazing during dry periods helps to maintain a high-quality cover of pasture plants.
- Reducing chemical applications and applying phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Poor filtering capacity
Management considerations:
- Onsite investigation is needed. The design of absorption fields should meet local and state guidelines.

Dwellings

Suitability: Well suited
Major management concerns: Dwellings without basements—water erosion, soil blowing; dwellings

with basements—water erosion, soil blowing, cutbanks caving

Management considerations:

- Onsite investigation is needed.
- Seeding and mulching exposed areas can help to control water erosion and soil blowing during and after construction.
- In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: IIe
Woodland ordination symbol: 3L (sugar maple)
Primary forest habitat type: ATD
Secondary forest habitat type: ATM

PaC—Padus sandy loam, 6 to 15 percent slopes

Setting

Landform: Outwash plains, stream terraces, eskers, and kames
Landscape position: Side slopes
Shape of areas: Irregular or long and narrow
Size of areas: 5 to 240 acres

Representative Profile

Surface layer:
0 to 5 inches—dark brown, friable sandy loam

Subsurface layer:
5 to 6 inches—brown, friable sandy loam

Subsoil:
6 to 19 inches—brown, friable sandy loam
19 to 31 inches—brown, friable sandy loam and strong brown, friable loam

Substratum:
31 to 60 inches—strong brown, loose, stratified sand and gravelly sand

Composition

Padus soil and similar inclusions: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:

- The somewhat excessively drained Pence soils, which have thinner loamy deposits than those of the Padus soil
- The excessively drained Vilas soils, which are sandy throughout
- Areas of stratified sandy, loamy, and silty deposits
- Areas that have stones or boulders on the surface
- Areas of wet soils in depressions
- Soils in which the substratum has pockets of sandy loam, loamy sand, gravelly sandy loam, or gravelly loamy sand
- Gently sloping or moderately steep areas of Padus soils

Similar inclusions:

- Areas of soils in which the upper layers are silt loam, loam, very fine sandy loam, fine sandy loam, or loamy sand
- Soils that have a substratum of sand, coarse sand, gravelly sand, gravelly coarse sand, very gravelly sand, or very gravelly coarse sand
- Soils in which the substratum is at a depth of more than 40 inches
- Soils that are eroded

Soil Properties and Qualities

Drainage class: Well drained
Depth class: Very deep
Permeability: Moderate in the solum and rapid or very rapid in the substratum
Available water capacity: Low or moderate
Organic matter content: Moderately low or moderate in the surface layer

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other uses—cropland, pasture

Woodland

Suitability: Suited
Major management concerns: Equipment limitation, plant competition
Management considerations:

- The slope limits the selection of log landing sites. Landings can be established on suitable nearly level or gently sloping adjacent or included soils.
- Ruts form easily on unsurfaced roads during wet periods. Log landings and haul roads can be stabilized with gravel.
- Plant competition can be controlled by mechanical site preparation or by limited use of herbicides.

Cropland

Suitability: Moderately well suited
Major management concerns: Water erosion, soil blowing, droughtiness, nutrient and pesticide loss
Management considerations:

- A conservation tillage system that leaves crop residue on the surface, contour stripcropping, and crop rotations that include close-growing crops help to control water erosion.

• Grassed waterways, diversions, and grade-stabilization structures help to prevent gully erosion and erosion from concentrated flow.
• Field windbreaks, wind stripcropping, a cover of crop residue, and a winter cover crop reduce the hazard of soil blowing and help to prevent the damage to plants caused by windblown sand.
• Crop yields are limited during most years by the restricted available water capacity. Irrigation can improve productivity.
• Crop residue management, additions of organic material, conservation tillage, and field windbreaks increase the water-holding capacity and conserve moisture. Reducing plant populations helps to ensure adequate moisture for all plants.
• Providing protection from water erosion, reducing chemical applications, and incorporating phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.

Pasture

Suitability: Well suited
Major management concerns: Water erosion, soil blowing, droughtiness, nutrient and pesticide loss
Management considerations:
• Establishing a high-quality cover of grasses and legumes can reduce the hazards of water erosion and soil blowing.
• Overgrazing depletes the plant cover, increases the hazards of water erosion and soil blowing, and increases the extent of undesirable plant species.
• Forage yields are limited during most years in areas where the available water capacity of the soil is low. Drought-tolerant species are best suited to this soil.
• Restricting grazing during dry periods helps to maintain a high-quality cover of pasture plants.
• Reducing chemical applications and applying phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Poor filtering capacity, slope
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and state guidelines.

Dwellings

Suitability: Moderately well suited
Major management concerns: Slope, water erosion, soil blowing, cutbanks caving
Management considerations:
• Onsite investigation is needed.
• Buildings can be designed so that they conform to the natural slope of the land. The slope can be modified by cutting and filling.
• Seeding and mulching exposed areas can help to control water erosion and soil blowing during and after construction.
• In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: IIIe
Woodland ordination symbol: 3L (sugar maple)
Primary forest habitat type: ATD
Secondary forest habitat type: ATM

PaD—Padus sandy loam, 15 to 35 percent slopes

Setting

Landform: Outwash plains, stream terraces, eskers, and kames
Landscape position: Side slopes
Shape of areas: Irregular or long and narrow
Size of areas: 5 to 240 acres

Representative Profile

Surface layer:
0 to 4 inches—dark brown, very friable sandy loam

Subsurface layer:
4 to 5 inches—brown, very friable sandy loam

Subsoil:
5 to 18 inches—dark brown and brown, very friable sandy loam
18 to 31 inches—reddish brown, friable loam

Substratum:
31 to 60 inches—strong brown, loose, stratified sand and gravelly sand

Composition

Padus soil and similar inclusions: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The somewhat excessively drained Pence soils, which have thinner loamy deposits than those of the Padus soil

• The excessively drained Vilas soils, which are sandy throughout
• Areas of stratified sandy, loamy, and silty deposits
• Areas that have stones and boulders on the surface
• Areas of wet soils in depressions
• Soils in which the substratum has pockets of sandy loam, loamy sand, gravelly sandy loam, or gravelly loamy sand
• Gently sloping, sloping, or very steep areas of Padus soils

Similar inclusions:
• Areas of soils in which the upper layers are silt loam, loam, very fine sandy loam, fine sandy loam, or loamy sand
• Soils that have a substratum of sand, coarse sand, gravelly sand, gravelly coarse sand, very gravelly sand, or very gravelly coarse sand
• Soils in which the substratum is at a depth of more than 40 inches
• Soils that are eroded

Soil Properties and Qualities

Drainage class: Well drained
Depth class: Very deep
Permeability: Moderate in the solum and rapid or very rapid in the substratum
Available water capacity: Low or moderate
Organic matter content: Moderately low or moderate in the surface layer

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other use—pasture

Woodland

Suitability: Suited
Major management concerns: Equipment limitation, erosion hazard, plant competition
Management considerations:
• The slope limits the selection of log landing sites. Landings can be established on suitable nearly level or gently sloping adjacent or included soils.
• Because the slope limits the use of conventional equipment, special harvesting and planting methods, such as yarding the logs by cable and planting seedlings by hand, may be needed.
• Carefully locating skid trails and building haul roads on the contour reduce the hazard of erosion and minimize equipment limitations.
• Ruts form easily on unsurfaced roads during wet periods. Log landings and haul roads can be stabilized with gravel.
• Seeding and mulching exposed areas after logging, sloping road surfaces to remove runoff water, and installing water bars, culverts, and drop structures can reduce the hazard of erosion.
• Plant competition can be controlled by mechanical site preparation or by limited use of herbicides.

Pasture

Suitability: Moderately well suited
Major management concerns: Water erosion, soil blowing, droughtiness, nutrient and pesticide loss
Management considerations:
• The steeper areas are generally limited to pasture of existing forage species. Maintaining a high-quality cover of pasture plants can reduce the hazard of water erosion and soil blowing.
• Overgrazing depletes the plant cover, increases the hazards of water erosion and soil blowing, and increases the extent of undesirable plant species.
• Forage yields are limited during most years in areas where the available water capacity of the soil is low. Drought-tolerant species are best suited to this soil.
• Restricting grazing during dry periods helps to maintain a high-quality cover of pasture plants.
• Reducing chemical applications and applying phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.

Cropland

Suitability: Generally unsuited because of the slope and the very severe hazard of water erosion

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Poor filtering capacity, slope
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and state guidelines.

Dwellings

Suitability: Poorly suited in the less sloping areas; generally unsuited in other areas
Major management concerns: Slope, water erosion, soil blowing, cutbanks caving
Management considerations:
• Onsite investigation is needed.
• In the less sloping areas, buildings can be designed so that they conform to the natural slope of the land. The slope can be modified by cutting and filling.
• Seeding and mulching exposed areas can help to control water erosion and soil blowing during and after construction.

• In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: VIe
Woodland ordination symbol: 3R (sugar maple)
Primary forest habitat type: ATD
Secondary forest habitat type: ATM

PeB—Padus-Pence sandy loams, 0 to 6 percent slopes

Setting

Landform: Outwash plains, stream terraces, eskers, and kames
Landscape position: Toeslopes, side slopes, and linear and slightly convex summits
Shape of areas: Irregular
Size of areas: 5 to 200 acres

Representative Profile

Padus

Surface layer:
0 to 3 inches—very dark brown, friable sandy loam

Subsurface layer:
3 to 4 inches—brown, very friable sandy loam

Subsoil:
4 to 11 inches—dark brown and brown, very friable sandy loam
11 to 22 inches—brown, friable sandy loam
22 to 26 inches—dark brown, friable loam
26 to 28 inches—brown, loose gravelly sand

Substratum:
28 to 60 inches—yellowish brown, loose, stratified sand and gravelly sand

Pence

Organic layer:
0 to 1 inch—black, very friable muck

Mineral surface layer:
1 to 6 inches—brown, very friable sandy loam

Subsoil:
6 to 16 inches—dark brown and brown, very friable sandy loam
16 to 26 inches—brown, very friable gravelly loamy sand

Substratum:
26 to 60 inches—strong brown, loose gravelly sand

Composition

Padus soil and similar inclusions: 55 to 65 percent
Pence soil and similar inclusions: 25 to 35 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The moderately well drained Manitowish and Tipler soils
• The excessively drained Vilas soils, which are sandy throughout
• The somewhat poorly drained Worcester and Wormet soils in depressions
• Areas that have stones and boulders on the surface
• Areas of stratified sandy, loamy, and silty deposits
• Soils in which the substratum has pockets of sandy loam, loamy sand, gravelly sandy loam, or gravelly loamy sand
• Sloping areas of Padus and Pence soils

Similar inclusions:
• Areas of soils in which the upper layers are loamy sand, fine sandy loam, loam, very fine sandy loam, or silt loam
• Soils that have a substratum of sand, coarse sand, gravelly coarse sand, very gravelly sand, or very gravelly coarse sand
• Soils in which the substratum is at a depth of more than 40 inches
• Soils that are eroded

Soil Properties and Qualities

Drainage class: Padus—well drained; Pence—somewhat excessively drained
Depth class: Very deep
Permeability: Padus—moderate in the solum and rapid or very rapid in the substratum; Pence—moderate or moderately rapid in the upper part and moderately rapid to very rapid in the lower part
Available water capacity: Padus—low or moderate; Pence—low
Organic matter content: Padus—moderately low or moderate in the surface layer; Pence—very high in the organic layer and moderately low or moderate in the mineral surface layer

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other uses—cropland, pasture

Woodland

Suitability: Suited
Major management concerns: Padus—equipment limitation, plant competition; Pence—no major soil limitations or hazards
Major management concerns:
• On the Padus soil, ruts form easily on unsurfaced roads during wet periods. Log landings and haul roads can be stabilized with gravel.
• Plant competition on the Padus soil can be controlled by mechanical site preparation or by limited use of herbicides.

Cropland

Suitability: Moderately well suited
Major management concerns: Water erosion, soil blowing, droughtiness, nutrient and pesticide loss
Management considerations:
• A conservation tillage system that leaves crop residue on the surface, contour stripcropping, and crop rotations that include close-growing crops help to control water erosion in the more sloping areas.
• Grassed waterways, diversions, and grade-stabilization structures help to prevent gully erosion and erosion from concentrated flow.
• Field windbreaks, wind stripcropping, a cover of crop residue, and a winter cover crop reduce the hazard of soil blowing and help to prevent the damage to plants caused by windblown sand.
• Crop yields are limited during most years by the restricted available water capacity. Irrigation can improve productivity.
• Crop residue management, additions of organic material, conservation tillage, and field windbreaks increase the water-holding capacity and conserve moisture. Reducing plant populations helps to ensure adequate moisture for all plants.
• Providing protection from water erosion, reducing chemical applications, and incorporating phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.
• Properly scheduling irrigation, reducing chemical applications, and providing split applications of nitrogen fertilizer at recommended rates during the growing season can reduce leaching losses on the Pence soil and protect the quality of ground water.

Pasture

Suitability: Well suited
Major management concerns: Water erosion, soil blowing, droughtiness, nutrient and pesticide loss
Management considerations:
• Establishing a high-quality cover of grasses and legumes can reduce the hazards of water erosion and soil blowing.
• Overgrazing depletes the plant cover, increases the hazards of water erosion and soil blowing, and increases the extent of undesirable plant species.
• Forage yields are limited during most years in areas where the available water capacity of the soils is restricted. Drought-tolerant species are best suited to these soils.
• Restricting grazing during dry periods helps to maintain a high-quality cover of pasture plants.
• Reducing chemical applications and applying nitrogen fertilizer at recommended rates can reduce leaching losses on the Pence soil and protect the quality of ground water.
• Reducing chemical applications and applying phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Poor filtering capacity
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and state guidelines.

Dwellings

Suitability: Well suited
Major management concerns: Dwellings without basements—water erosion, soil blowing; dwellings with basements—water erosion, soil blowing, cutbanks caving
Management considerations:
• Onsite investigation is needed.
• Seeding and mulching exposed areas can help to control water erosion and soil blowing during and after construction.
• In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: IIIe

Woodland ordination symbol: Padus—3L (sugar maple); Pence—3A (sugar maple)
Primary forest habitat type: ATD
Secondary forest habitat type: ATM or PMV

PeC—Padus-Pence sandy loams, 6 to 15 percent slopes

Setting

Landform: Outwash plains, stream terraces, eskers, and kames
Landscape position: Side slopes
Shape of areas: Irregular or long and narrow
Size of areas: 5 to 400 acres

Representative Profile

Padus

Organic layer:
0 to 1 inch—black, very friable muck

Mineral surface layer:
1 to 5 inches—brown, very friable sandy loam

Subsoil:
5 to 21 inches—reddish brown and brown, very friable sandy loam
21 to 28 inches—strong brown, very friable sandy loam
28 to 34 inches—strong brown, very friable loamy sand

Substratum:
34 to 61 inches—yellowish brown, loose, stratified sand and gravelly sand

Pence

Surface layer:
0 to 2 inches—very dark grayish brown, friable sandy loam

Subsurface layer:
2 to 3 inches—brown, friable sandy loam

Subsoil:
3 to 17 inches—brown, friable sandy loam
17 to 26 inches—strong brown, friable gravelly loamy sand

Substratum:
26 to 60 inches—strong brown, loose gravelly sand

Composition

Padus soil and similar inclusions: 55 to 65 percent
Pence soil and similar inclusions: 25 to 35 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
- The excessively drained Vilas soils, which are sandy throughout
- Areas that have stones and boulders on the surface
- Areas of wet soils in depressions
- Areas of stratified sandy, loamy, and silty deposits
- Soils in which the substratum has pockets of sandy loam, loamy sand, gravelly sandy loam, or gravelly loamy sand
- Gently sloping or moderately steep areas of Padus and Pence soils

Similar inclusions:
- Areas of soils in which the upper layers are loamy sand, fine sandy loam, loam, very fine sandy loam, or silt loam
- Soils that have a substratum of sand, coarse sand, gravelly coarse sand, very gravelly sand, or very gravelly coarse sand
- Soils that are eroded

Soil Properties and Qualities

Drainage class: Padus—well drained; Pence—somewhat excessively drained
Depth class: Very deep
Permeability: Padus—moderate in the solum and rapid or very rapid in the substratum; Pence—moderate or moderately rapid in the upper part and moderately rapid to very rapid in the lower part
Available water capacity: Padus—low or moderate; Pence—low
Organic matter content: Padus—very high in the organic layer and moderately low or moderate in the mineral surface layer; Pence—moderately low or moderate in the surface layer

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other uses—cropland, pasture

Woodland

Suitability: Suited
Major management concerns: Padus—equipment limitation, plant competition; Pence—equipment limitation
Management considerations:
- The slope limits the selection of log landing sites. Landings can be established on suitable nearly level or gently sloping adjacent or included soils.
- On the Padus soil, ruts form easily on unsurfaced roads during wet periods. Log landings and haul roads can be stabilized with gravel.
- Plant competition on the Padus soil can be

controlled by mechanical site preparation or by limited use of herbicides.

Cropland

Suitability: Poorly suited
Major management concerns: Water erosion, soil blowing, droughtiness, nutrient and pesticide loss
Management considerations:
• A conservation tillage system that leaves crop residue on the surface, contour stripcropping, and crop rotations that include close-growing crops help to control water erosion.
• Grassed waterways, diversions, and grade-stabilization structures help to prevent gully erosion and erosion from concentrated flow.
• Field windbreaks, wind stripcropping, a cover of crop residue, and a winter cover crop reduce the hazard of soil blowing and help to prevent the damage to plants caused by windblown sand.
• Crop yields are limited during most years by the restricted available water capacity. Irrigation can improve productivity.
• Crop residue management, additions of organic material, conservation tillage, and field windbreaks increase the water-holding capacity and conserve moisture. Reducing plant populations helps to ensure adequate moisture for all plants.
• Providing protection from water erosion, reducing chemical applications, and incorporating phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.
• Properly scheduling irrigation, reducing chemical applications, and providing split applications of nitrogen fertilizer at recommended rates during the growing season can reduce leaching losses on the Pence soil and protect the quality of ground water.

Pasture

Suitability: Moderately well suited
Major management concerns: Water erosion, soil blowing, droughtiness, nutrient and pesticide loss
Management considerations:
• Establishing a high-quality cover of grasses and legumes can reduce the hazards of water erosion and soil blowing.
• Overgrazing depletes the plant cover, increases the hazards of water erosion and soil blowing, and increases the extent of undesirable plant species.
• Forage yields are limited during most years in areas where the available water capacity of the soils is restricted. Drought-tolerant species are best suited to these soils.
• Restricting grazing during dry periods helps to maintain a high-quality cover of pasture plants.
• Reducing chemical applications and applying nitrogen fertilizer at recommended rates can reduce leaching losses on the Pence soil and protect the quality of ground water.
• Reducing chemical applications and applying phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Poor filtering capacity, slope
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and state guidelines.

Dwellings

Suitability: Moderately well suited
Major management concerns: Slope, water erosion, soil blowing, cutbanks caving
Management considerations:
• Onsite investigation is needed.
• Buildings can be designed so that they conform to the natural slope of the land. The slope can be modified by cutting and filling.
• Seeding and mulching exposed areas can help to control water erosion and soil blowing during and after construction.
• In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: IVe
Woodland ordination symbol: Padus—3L (sugar maple); Pence—3A (sugar maple)
Primary forest habitat type: ATD
Secondary forest habitat type: ATM or PMV

PeD—Padus-Pence sandy loams, 15 to 35 percent slopes

Setting

Landform: Outwash plains, stream terraces, eskers, and kames
Landscape position: Side slopes
Shape of areas: Irregular or long and narrow
Size of areas: 5 to 300 acres

Representative Profile

Padus

Surface layer:
0 to 2 inches—black, friable sandy loam

Subsurface layer:
2 to 5 inches—brown, friable sandy loam

Subsoil:
5 to 17 inches—brown, friable sandy loam
17 to 27 inches—strong brown and brown, friable sandy loam
27 to 33 inches—strong brown, very friable gravelly loamy sand

Substratum:
33 to 60 inches—brown, loose, stratified sand and gravelly sand

Pence

Surface layer:
0 to 2 inches—dark reddish brown, very friable sandy loam

Subsurface layer:
2 to 3 inches—reddish gray, very friable sandy loam

Subsoil:
3 to 15 inches—dark reddish brown and reddish brown, very friable sandy loam
15 to 18 inches—strong brown, very friable gravelly loamy sand

Substratum:
18 to 60 inches—strong brown gravelly sand

Composition

Padus soil and similar inclusions: 55 to 65 percent
Pence soil and similar inclusions: 25 to 35 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
- The excessively drained Rubicon and Vilas soils, which are sandy throughout
- Areas that have stones and boulders on the surface
- Areas of wet soils in depressions
- Areas of stratified sandy, loamy, and silty deposits
- Soils in which the substratum has pockets of sandy loam, loamy sand, gravelly sandy loam, or gravelly loamy sand
- Gently sloping, sloping, or very steep areas of Padus and Pence soils

Similar inclusions:
- Areas of soils in which the upper layers are loamy sand, fine sandy loam, loam, very fine sandy loam, or silt loam
- Soils that have a substratum of sand, coarse sand, gravelly coarse sand, very gravelly sand, or very gravelly coarse sand
- Soils that are eroded

Soil Properties and Qualities

Drainage class: Padus—well drained; Pence—somewhat excessively drained
Depth class: Very deep
Permeability: Padus—moderate in the solum and rapid or very rapid in the substratum; Pence—moderate or moderately rapid in the upper part and moderately rapid to very rapid in the lower part
Available water capacity: Padus—low or moderate; Pence—low
Organic matter content: Moderately low or moderate in the surface layer

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other use—pasture

Woodland

Suitability: Suited
Major management concerns: Padus—equipment limitation, erosion hazard, plant competition; Pence—equipment limitation, erosion hazard
Management considerations:
- The slope limits the selection of log landing sites. Landings can be established on suitable nearly level or gently sloping adjacent or included soils.
- Because the slope limits the use of conventional equipment, special harvesting and planting methods, such as yarding the logs by cable and planting seedlings by hand, may be needed.
- Carefully locating skid trails and building haul roads on the contour reduce the hazard of erosion and minimize equipment limitations.
- On the Padus soil, ruts form easily on unsurfaced roads during wet periods. Log landings and haul roads can be stabilized with gravel.
- Seeding and mulching exposed areas after logging, sloping road surfaces to remove runoff water, and installing water bars, culverts, and drop structures reduce the hazard of erosion.
- Plant competition on the Padus soil can be controlled by mechanical site preparation or by limited use of herbicides.

Pasture

Suitability: Poorly suited
Major management concerns: Water erosion, soil blowing, droughtiness, nutrient and pesticide loss
Management considerations:
• The steeper areas are generally limited to pasture of existing forage species. Maintaining a high-quality cover of pasture plants can reduce the hazards of water erosion and soil blowing.
• Overgrazing depletes the plant cover, increases the hazards of water erosion and soil blowing, and increases the extent of undesirable plant species.
• Forage yields are limited during most years in areas where the available water capacity of the soil is restricted. Drought-tolerant species are best suited to these soils.
• Restricting grazing during dry periods helps to maintain a high-quality cover of pasture plants.
• Reducing chemical applications and applying nitrogen fertilizer at recommended rates can reduce leaching losses on the Pence soil and protect the quality of ground water.
• Reducing chemical applications and applying phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.

Cropland

Suitability: Generally unsuited because of the slope and the very severe hazard of water erosion

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Poor filtering capacity, slope
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and state guidelines.

Dwellings

Suitability: Poorly suited in the less sloping areas; generally unsuited in other areas
Major management concerns: Slope, water erosion, soil blowing, cutbanks caving
Management considerations:
• Onsite investigation is needed.
• In the less sloping areas, buildings can be designed so that they conform to the natural slope of the land. The slope can be modified by cutting and filling.
• Seeding and mulching exposed areas can help to control water erosion and soil blowing during and after construction.
• In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: VIIe
Woodland ordination symbol: 3R (sugar maple)
Primary forest habitat type: ATD
Secondary forest habitat type: ATM or PMV

PfD—Padus-Soperton silt loams, 15 to 35 percent slopes, very stony

Setting

Landform: Drumlins and moraines
Landscape position: Side slopes
Shape of areas: Irregular or long and narrow
Size of areas: 5 to 180 acres

Representative Profile

Padus

Organic layer:
0 to 1 inch—black, very friable muck

Mineral surface layer:
1 to 3 inches—brown, friable silt loam

Subsoil:
3 to 11 inches—brown, friable silt loam
11 to 17 inches—strong brown and brown, friable sandy loam
17 to 26 inches—strong brown, friable gravelly sandy loam
26 to 33 inches—yellowish brown, very friable gravelly loamy sand

Substratum:
33 to 60 inches—yellowish brown, loose, stratified sand and very gravelly coarse sand

Soperton

Organic layer:
0 to 1 inch—black, very friable muck

Mineral surface layer:
1 to 3 inches—brown, friable silt loam

Subsoil:
3 to 23 inches—brown, dark yellowish brown, and pale brown, friable silt loam
23 to 30 inches—strong brown, firm gravelly sandy loam
30 to 45 inches—brown, friable gravelly loamy sand

Substratum:
45 to 60 inches—brown, friable gravelly loamy sand

Composition

Padus soil and similar inclusions: 55 to 65 percent
Soperton soil and similar inclusions: 25 to 35 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
- The moderately well drained Goodwit and Wabeno soils in the less sloping areas
- The somewhat excessively drained Pence soils, which have loamy upper layers less than 20 inches thick underlain by sandy and gravelly glacial outwash
- Areas of stratified sandy, loamy, and silty deposits
- Areas of wet soils in depressions
- Soils that are bouldery
- Gently sloping, sloping, or very steep areas of Padus and Soperton soils

Similar inclusions:
- Areas of soils in which the upper layers are very fine sandy loam, fine sandy loam, loam, sandy loam, or loamy sand
- Soils in which the silty deposits are as much as 60 inches thick
- Areas of Padus soils that have a substratum of sand, coarse sand, gravelly sand, gravelly coarse sand, very gravelly sand, or very gravelly coarse sand
- Areas of Soperton soils that have a substratum of loamy sand, sandy loam, or gravelly sandy loam

Soil Properties and Qualities

Drainage class: Well drained
Depth class: Padus—very deep; Soperton—moderately deep to a fragipan
Permeability: Padus—moderate in the solum and rapid or very rapid in the substratum; Soperton—moderate in the upper part, slow in the fragipan, and moderate or moderately rapid in the lower part
Available water capacity: Low or moderate
Organic matter content: Very high in the organic layer and moderate in the mineral surface layer
Percent of surface covered by stones: Padus—none; Soperton—about 0.1 to 3.0

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other use—pasture

Woodland

Suitability: Suited
Major management concerns: Padus—equipment limitation, erosion hazard, plant competition; Soperton—equipment limitation, erosion hazard, windthrow hazard, plant competition
Management considerations:
- The slope limits the selection of log landing sites. Landings can be established on suitable nearly level or gently sloping adjacent or included soils.
- Because the slope limits the use of conventional equipment, special harvesting and planting methods, such as yarding the logs by cable and planting seedlings by hand, may be needed.
- Carefully locating skid trails and building haul roads on the contour reduce the hazard of erosion and minimize equipment limitations.
- Ruts form easily on unsurfaced roads during wet periods. Log landings and haul roads can be stabilized with gravel.
- Seeding and mulching exposed areas after logging, sloping road surfaces to remove runoff water, and installing water bars, culverts, and drop structures reduce the hazard of erosion.
- Windthrow on the Soperton soil can be minimized by using harvest methods that do not leave the remaining trees widely spaced. The periodic salvaging of windthrown trees may be needed.
- Plant competition can be controlled by mechanical site preparation or by limited use of herbicides.

Pasture

Suitability: Poorly suited
Major management concerns: Padus—water erosion, nutrient and pesticide loss; Soperton—water erosion, droughtiness, nutrient and pesticide loss, rock fragments
Management considerations:
- The steeper areas are generally limited to pasture of existing forage species. Maintaining a high-quality cover of pasture plants can reduce the hazard of water erosion.
- Overgrazing depletes the plant cover, increases the hazard of water erosion, and increases the extent of undesirable plant species.
- Forage yields on the Soperton soil are limited during most years by the restricted available water capacity. Drought-tolerant species are best suited to this soil.
- Restricting grazing during dry periods helps to maintain a high-quality cover of pasture plants.
- Reducing chemical applications and applying phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.
- Surface stones may interfere with the use of machinery in areas of the Soperton soil.

Cropland

Suitability: Generally unsuited because of surface stones, the slope, and the very severe hazard of water erosion

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Padus—poor filtering capacity, slope; Soperton—restricted permeability, slope
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and state guidelines.

Dwellings

Suitability: Poorly suited in the less sloping areas; generally unsuited in other areas
Major management concerns: Slope, water erosion, cutbanks caving
Management considerations:
• Onsite investigation is needed.
• In the less sloping areas, buildings can be designed so that they conform to the natural slope of the land. The slope can be modified by cutting and filling.
• Seeding and mulching exposed areas can help to control water erosion during and after construction.
• In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: VIIe in very stony areas; VIe in nonstony areas
Woodland ordination symbol: 3R (sugar maple)
Primary forest habitat type: AViO
Secondary forest habitat type: ATD

PgB—Padus-Wabeno silt loams, 1 to 6 percent slopes, very stony

Setting

Landform: Drumlins and moraines
Landscape position: Shoulders and linear and slightly convex summits
Shape of areas: Irregular or long and narrow
Size of areas: 5 to 200 acres

Representative Profile

Padus

Surface layer:
0 to 2 inches—dark brown, very friable silt loam

Subsurface layer:
2 to 3 inches—brown, very friable silt loam

Subsoil:
3 to 12 inches—brown, very friable silt loam
12 to 28 inches—brown, friable loam
28 to 33 inches—strong brown, very friable gravelly loamy sand

Substratum:
33 to 60 inches—strong brown, loose, stratified sand and very gravelly sand

Wabeno

Surface layer:
0 to 3 inches—dark brown, friable silt loam

Subsurface layer:
3 to 5 inches—brown, friable silt loam

Subsoil:
5 to 25 inches—brown, light brown, and strong brown, friable silt loam
25 to 31 inches—strong brown and light brown, mottled, friable silt loam
31 to 39 inches—strong brown, mottled, firm gravelly sandy loam
39 to 48 inches—strong brown, mottled, friable gravelly loamy sand

Substratum:
48 to 60 inches—strong brown, mottled, friable gravelly loamy sand

Composition

Padus soil and similar inclusions: 55 to 65 percent
Wabeno soil and similar inclusions: 25 to 35 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Mudlake and Whisklake soils in depressions
• The somewhat excessively drained Pence soils, which have loamy upper layers less than 20 inches thick underlain by sandy and gravelly glacial outwash
• Poorly drained soils in depressions
• Areas of stratified sandy, loamy, and silty deposits
• Sloping areas of Padus and Wabeno soils
• Soils that are bouldery

Similar inclusions:
• Areas of soils in which the upper layers are very fine sandy loam, fine sandy loam, loam, sandy loam, or loamy sand
• Soils in which the silty deposits are as much as 60 inches thick

• Areas of Padus soils that have a substratum of sand, coarse sand, gravelly sand, gravelly coarse sand, very gravelly sand, or very gravelly coarse sand
• Areas of Wabeno soils that have a substratum of loamy sand, sandy loam, or gravelly sandy loam

Soil Properties and Qualities

Drainage class: Padus—well drained; Wabeno—moderately well drained
Seasonal high water table: Wabeno—perched, 1.5 to 3.0 feet below the surface
Depth class: Padus—very deep; Wabeno—moderately deep to a fragipan
Permeability: Padus—moderate in the solum and rapid or very rapid in the substratum; Wabeno—moderate in the upper part, slow in the fragipan, and moderate in the substratum
Available water capacity: Low or moderate
Organic matter content: Padus—moderate in the surface layer; Wabeno—moderately low or moderate in the surface layer
Percent of surface covered by stones: Padus—none; Wabeno—about 0.1 to 3.0

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other uses—cropland, pasture

Woodland

Suitability: Suited
Major management concerns: Padus—equipment limitation, plant competition; Wabeno—equipment limitation, windthrow hazard, plant competition
Management considerations:
• Ruts form easily on unsurfaced roads during wet periods. Log landings and haul roads can be stabilized with gravel.
• Windthrow on the Wabeno soil can be minimized by using harvest methods that do not leave the remaining trees widely spaced. The periodic salvaging of windthrown trees may be needed.
• Plant competition can be controlled by mechanical site preparation or by limited use of herbicides.

Cropland

Suitability: Well suited in areas where surface stones have been removed; poorly suited in other areas
Major management concerns: Padus—water erosion, droughtiness, nutrient and pesticide loss, poor tilth; Wabeno—water erosion, droughtiness, nutrient and pesticide loss, poor tilth, rock fragments
Management considerations:
• A conservation tillage system that leaves crop residue on the surface, contour stripcropping, and crop rotations that include close-growing crops help to control water erosion in the more sloping areas.
• Grassed waterways, diversions, and grade-stabilization structures help to prevent gully erosion and erosion from concentrated flow.
• Crop yields are limited during most years by the restricted available water capacity. Irrigation can improve productivity.
• Crop residue management, additions of organic material, conservation tillage, and field windbreaks increase the water-holding capacity and conserve moisture. Reducing plant populations helps to ensure adequate moisture for all plants.
• Providing protection from water erosion, reducing chemical applications, and incorporating phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.
• Leaving crop residue on the surface or regularly adding other organic material helps to maintain fertility and good tilth and minimizes crusting.
• Some areas of the Wabeno soil have stones on the surface. Unless they are removed, the stones interfere with tillage.

Pasture

Suitability: Moderately well suited
Major management concerns: Padus—water erosion, nutrient and pesticide loss; Wabeno—droughtiness, rock fragments
Management considerations:
• Establishing a high-quality cover of grasses and legumes can reduce the hazard of water erosion on the Padus soil.
• Overgrazing depletes the plant cover, increases the hazard of water erosion, and increases the extent of undesirable plant species.
• Forage yields on the Wabeno soil are limited during most years by the restricted available water capacity. Drought-tolerant species are best suited to this soil.
• Restricting grazing during dry periods helps to maintain a high-quality cover of pasture plants.
• In areas of the Padus soil, reducing chemical applications and applying phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.
• Surface stones on the Wabeno soil may interfere with the use of machinery.

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Padus—poor filtering

capacity; Wabeno—restricted permeability, wetness
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and state guidelines.

Dwellings without basements

Suitability: Padus—well suited; Wabeno—moderately well suited
Major management concerns: Padus—water erosion; Wabeno—wetness, water erosion
Management considerations:
• Onsite investigation is needed.
• Installing a subsurface drainage system and adding fill material to raise the elevation of the site help to overcome the wetness in areas of the Wabeno soil.
• Seeding and mulching exposed areas can help to control water erosion during and after construction.

Dwellings with basements

Suitability: Padus—well suited; Wabeno—poorly suited
Major management concerns: Padus—water erosion, cutbanks caving; Wabeno—wetness, water erosion, cutbanks caving
Management considerations:
• Onsite investigation is needed.
• Installing a subsurface drainage system and adding fill material to raise the elevation of the site help to overcome the wetness in areas of the Wabeno soil.
• Seeding and mulching exposed areas can help to control water erosion during and after construction.
• In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: IVs in very stony areas; IIe in nonstony areas
Woodland ordination symbols: 3L (sugar maple)
Primary forest habitat type: AViO
Secondary forest habitat type: ATD

PgC—Padus-Wabeno silt loams, 6 to 15 percent slopes, very stony

Setting

Landform: Drumlins and moraines
Landscape position: Side slopes
Shape of areas: Irregular or long and narrow
Size of areas: 5 to 120 acres

Representative Profile

Padus

Organic layer:
0 to 1 inch—black, very friable muck

Mineral surface layer:
1 to 3 inches—brown, friable silt loam

Subsoil:
3 to 12 inches—brown, friable silt loam
12 to 23 inches—brown, friable loam
23 to 31 inches—brown, very friable gravelly loamy sand

Substratum:
31 to 60 inches—brown, loose, stratified sand and very gravelly coarse sand

Wabeno

Organic layer:
0 to 1 inch—black, very friable muck

Mineral surface layer:
1 to 4 inches—pale brown, friable silt loam

Subsoil:
4 to 16 inches—brown, friable silt loam
16 to 21 inches—pale brown and dark yellowish brown, friable silt loam
21 to 28 inches—dark yellowish brown and pale brown, friable silt loam
28 to 35 inches—dark brown, mottled, firm sandy loam
35 to 51 inches—brown, mottled, friable sandy loam and loamy sand

Substratum:
51 to 60 inches—brown, mottled, friable loamy sand

Composition

Padus soil and similar inclusions: 55 to 65 percent
Wabeno soil and similar inclusions: 25 to 35 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The somewhat excessively drained Pence soils, which have loamy upper layers less than 20 inches thick underlain by sandy and gravelly glacial outwash
• Areas of stratified sandy, loamy, and silty deposits
• Areas of wet soils in depressions
• Gently sloping or moderately steep areas of Padus and Wabeno soils
• Soils that are bouldery

Similar inclusions:
- Areas of soils in which the upper layers are very fine sandy loam, fine sandy loam, loam, sandy loam, or loamy sand
- Soils in which the silty deposits are as much as 60 inches thick
- Areas of Padus soils that have a substratum of sand, coarse sand, gravelly sand, gravelly coarse sand, very gravelly sand, or very gravelly coarse sand
- Areas of Wabeno soils that have a substratum of sandy loam, gravelly sandy loam, or gravelly loamy sand

Soil Properties and Qualities

Drainage class: Padus—well drained; Wabeno—moderately well drained
Seasonal high water table: Wabeno—perched, 1.5 to 3.0 feet below the surface
Depth class: Padus—very deep; Wabeno—moderately deep to a fragipan
Permeability: Padus—moderate in the solum and rapid or very rapid in the substratum; Wabeno—moderate in the upper part, slow in the fragipan, and moderate in the substratum
Available water capacity: Low or moderate
Organic matter content: Padus—very high in the organic layer and moderate in the mineral surface layer; Wabeno—very high in the organic layer and moderately low or moderate in the mineral surface layer
Percent of surface covered by stones: Padus—none; Wabeno—about 0.1 to 3.0

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other uses—cropland, pasture

Woodland

Suitability: Suited
Major management concerns: Padus—equipment limitation, plant competition; Wabeno—equipment limitation, windthrow hazard, plant competition
Management considerations:
- The slope limits the selection of log landing sites. Landings can be established on suitable nearly level or gently sloping adjacent or included soils.
- Ruts form easily on unsurfaced roads during wet periods. Log landings and haul roads can be stabilized with gravel.
- Windthrow on the Wabeno soil can be minimized by using harvest methods that do not leave the remaining trees widely spaced. The periodic salvaging of windthrown trees may be needed.
- Plant competition can be controlled by mechanical site preparation or by limited use of herbicides.

Cropland

Suitability: Moderately well suited in areas where surface stones have been removed; generally unsuited in other areas
Major management concerns: Padus—water erosion, droughtiness, nutrient and pesticide loss, poor tilth; Wabeno—water erosion, droughtiness, nutrient and pesticide loss, poor tilth, rock fragments
Management considerations:
- A conservation tillage system that leaves crop residue on the surface, contour stripcropping, and crop rotations that include close-growing crops help to control water erosion.
- Grassed waterways, diversions, and grade-stabilization structures help to prevent gully erosion and erosion from concentrated flow.
- Crop yields are limited during most years by the restricted available water capacity. Irrigation can improve productivity.
- Crop residue management, additions of organic material, conservation tillage, and field windbreaks increase the water-holding capacity and conserve moisture. Reducing plant populations helps to ensure adequate moisture for all plants.
- Providing protection from water erosion, reducing chemical applications, and incorporating phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.
- Leaving crop residue on the surface or regularly adding other organic material helps to maintain fertility and good tilth and minimizes crusting.
- Some areas of the Wabeno soil have stones on the surface. Unless they are removed, the stones interfere with tillage.

Pasture

Suitability: Moderately well suited
Major management concerns: Padus—water erosion, nutrient and pesticide loss; Wabeno—water erosion, droughtiness, nutrient and pesticide loss, rock fragments
Management considerations:
- Establishing a high-quality cover of grasses and legumes can reduce the hazard of water erosion.
- Overgrazing depletes the plant cover, increases the hazard of water erosion, and increases the extent of undesirable plant species.
- Forage yields on the Wabeno soil are limited during

most years by the restricted available water capacity. Drought-tolerant species are best suited to this soil.
• Restricting grazing during dry periods helps to maintain a high-quality cover of pasture plants.
• Reducing chemical applications and applying phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.
• Surface stones on the Wabeno soil may interfere with the use of machinery.

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Padus—poor filtering capacity, slope; Wabeno—restricted permeability, wetness, slope
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and state guidelines.

Dwellings without basements

Suitability: Moderately well suited
Major management concerns: Padus—slope, water erosion, cutbanks caving; Wabeno—wetness, slope, water erosion, cutbanks caving
Management considerations:
• Onsite investigation is needed.
• Installing a subsurface drainage system and adding fill material to raise the elevation of the site help to overcome the wetness in areas of the Wabeno soil.
• Buildings can be designed so that they conform to the natural slope of the land. The slope can be modified by cutting and filling.
• Seeding and mulching exposed areas can help to control water erosion during and after construction.
• In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Dwellings with basements

Suitability: Padus—moderately well suited; Wabeno—poorly suited
Major management concerns: Padus—slope, water erosion, cutbanks caving; Wabeno—wetness, slope, water erosion, cutbanks caving
Management considerations:
• Onsite investigation is needed.
• Installing a subsurface drainage system and adding fill material to raise the elevation of the site help to overcome the wetness in areas of the Wabeno soil.
• Buildings can be designed so that they conform to the natural slope of the land. The slope can be modified by cutting and filling.
• Seeding and mulching exposed areas can help to control water erosion during and after construction.
• In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: VIs in very stony areas; IIIe in nonstony areas
Woodland ordination symbols: 3L (sugar maple)
Primary forest habitat type: AViO
Secondary forest habitat type: ATD

PhB—Padwood sandy loam, 0 to 6 percent slopes

Setting

Landform: Outwash plains, stream terraces, and glacial lake plains
Landscape position: Linear areas, toeslopes, and footslopes
Shape of areas: Irregular
Size of areas: 5 to 100 acres

Representative Profile

Organic layer:
0 to 1 inch—black, very friable muck

Mineral surface layer:
1 to 6 inches—grayish brown, friable sandy loam

Subsoil:
6 to 30 inches—brown and strong brown, friable sandy loam
30 to 33 inches—strong brown, very friable loamy sand

Substratum:
33 to 46 inches—strong brown, loose sand
46 to 61 inches—yellowish red, pinkish gray, brown, and yellowish brown, mottled, friable and loose, stratified silt loam, fine sandy loam, and sand

Composition

Padwood soil and similar inclusions: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The well drained Padus and Tipler soils, which are underlain by sandy or sandy and gravelly glacial outwash
• The well drained Sarona and Sarwet soils, which are

underlain by sandy or loamy glacial till or glacial mudflow sediment
• The somewhat poorly drained Worcester soils, which are underlain by sandy or sandy and gravelly glacial outwash; in depressions
• Soils that are well drained
• Areas that have stones and boulders on the surface
• Areas of Padwood soils that have slopes of 6 to 10 percent

Similar inclusions:
• Areas of soils in which the upper layers are silt loam, loam, very fine sandy loam, fine sandy loam, or loamy sand
• Soils that are eroded
• Soils that have an apparent seasonal high water table

Soil Properties and Qualities

Drainage class: Moderately well drained
Seasonal high water table: Perched, 2.5 to 3.5 feet below the surface
Depth class: Very deep
Permeability: Moderate in the loamy mantle, rapid or very rapid in the sandy outwash, and moderately slow in the lacustrine deposits
Available water capacity: Moderate
Organic matter content: Very high in the organic layer and moderate in the mineral surface layer

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other uses—cropland, pasture

Woodland

Suitability: Suited
Major management concerns: Equipment limitation, plant competition
Management considerations:
• Ruts form easily on unsurfaced roads during wet periods. Log landings and haul roads can be stabilized with gravel.
• Plant competition can be controlled by mechanical site preparation or by limited use of herbicides.

Cropland

Suitability: Well suited
Major management concerns: Water erosion, soil blowing, droughtiness, nutrient and pesticide loss
Management considerations:
• A conservation tillage system that leaves crop residue on the surface, contour stripcropping, and crop rotations that include close-growing crops help to control water erosion in the more sloping areas.
• Grassed waterways, diversions, and grade-stabilization structures help to prevent gully erosion and erosion from concentrated flow.
• Field windbreaks, wind stripcropping, a cover of crop residue, and a winter cover crop reduce the hazard of soil blowing and help to prevent the damage to plants caused by windblown sand.
• Crop yields are somewhat limited during dry years by the restricted available water capacity.
• Crop residue management, additions of organic material, conservation tillage, and field windbreaks increase the water-holding capacity and conserve moisture. Reducing plant populations helps to ensure adequate moisture for all plants.
• Providing protection from water erosion, reducing chemical applications, and incorporating phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.

Pasture

Suitability: Well suited
Major management concerns: Water erosion, soil blowing, nutrient and pesticide loss
Management considerations:
• Establishing a high-quality cover of grasses and legumes can reduce the hazards of water erosion and soil blowing.
• Overgrazing depletes the plant cover, increases the hazards of water erosion and soil blowing, and increases the extent of undesirable plant species.
• Reducing chemical applications and applying phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Poor filtering capacity, restricted permeability, wetness
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and state guidelines.

Dwellings without basements

Suitability: Well suited
Major management concerns: Water erosion, soil blowing
Management considerations:
• Onsite investigation is needed.
• Seeding and mulching exposed areas can help to control water erosion and soil blowing during and after construction.

Dwellings with basements

Suitability: Moderately well suited
Major management concerns: Wetness, water erosion, soil blowing, cutbanks caving
Management considerations:
• Onsite investigation is needed.
• Installing a subsurface drainage system and adding fill material to raise the elevation of the site help to overcome the wetness.
• Seeding and mulching exposed areas can help to control water erosion and soil blowing during and after construction.
• In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: IIe
Woodland ordination symbol: 3L (sugar maple)
Primary forest habitat type: ATD
Secondary forest habitat type: ATM or AViO

PkE—Pelissier gravelly sandy loam, 20 to 45 percent slopes, stony

Setting

Landform: Eskers
Shape of areas: Long and narrow
Size of areas: 5 to 250 acres

Representative Profile

Organic layer:
0 to 1 inch—black, very friable peat

Mineral surface layer:
1 to 3 inches—brown, very friable gravelly sandy loam

Subsoil:
3 to 8 inches—dark brown, very friable gravelly coarse sandy loam
8 to 22 inches—brown and strong brown, very friable very gravelly loamy coarse sand

Substratum:
22 to 61 inches—yellowish brown, loose very gravelly coarse sand

Composition

Pelissier soil and similar inclusions: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The well drained Padus and somewhat excessively drained Pence soils, which contain less gravel than the Pelissier soil
• Rubicon and Vilas soils, which are sandy throughout
• Gently sloping and sloping areas of Pelissier soils
• Soils in which the substratum contains pockets of loamy sand, gravelly loamy sand, very gravelly loamy sand, cobbly loamy sand, or very cobbly loamy sand
• Areas of Pelissier soils that are nonstony, are very stony, or are bouldery

Similar inclusions:
• Areas of soils in which the upper layers are loamy sand, sandy loam, loam, gravelly loamy sand, or gravelly loamy coarse sand
• Soils that have a substratum of stratified sand and very gravelly sand; extremely gravelly, very cobbly, or extremely cobbly coarse sand; or very gravelly, extremely gravelly, very cobbly, or extremely cobbly sand

Soil Properties and Qualities

Drainage class: Excessively drained
Depth class: Very deep
Permeability: Moderately rapid in the upper part and very rapid in the lower part
Available water capacity: Very low
Organic matter content: Very high in the organic layer and low in the mineral surface layer
Percent of surface covered by rock fragments: About 0.01 to 0.1

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other use—pasture

Woodland

Suitability: Suited
Major management concerns: Equipment limitation, erosion hazard, seedling mortality
Management considerations:
• The slope limits the selection of log landing sites. Landings can be established on suitable nearly level or gently sloping adjacent or included soils.
• Because the slope limits the use of conventional equipment, special harvesting and planting methods, such as yarding the logs by cable and planting seedlings by hand, may be needed.
• Carefully locating skid trails and building haul roads on the contour reduce the hazard of erosion and minimize equipment limitations.

• Seeding and mulching exposed areas after logging, sloping road surfaces to remove runoff water, and installing water bars, culverts, and drop structures reduce the hazard of erosion.
• Seedling mortality can be minimized by using harvest methods that leave some mature trees to provide shade and protection and by planting vigorous nursery stock in the early spring, when the soil is moist.

Pasture

Suitability: Poorly suited
Major management concerns: Water erosion, soil blowing, droughtiness, nutrient and pesticide loss, rock fragments
Management considerations:
• The steeper areas are generally limited to pasture of existing forage species. Maintaining a high-quality cover of pasture plants can reduce the hazards of water erosion and soil blowing.
• Overgrazing depletes the plant cover, increases the hazards of water erosion and soil blowing, and increases the extent of undesirable plant species.
• Forage yields are limited by the restricted available water capacity. Drought-tolerant species are best suited to this soil.
• Restricting grazing during dry periods helps to maintain a high-quality cover of pasture plants.
• Reducing chemical applications and applying nitrogen fertilizer at recommended rates can reduce leaching losses and protect the quality of ground water.
• Reducing chemical applications and applying phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.
• Surface stones may interfere with the use of machinery.

Cropland

Suitability: Generally unsuited because of the slope, the very severe hazard of water erosion, and the extreme droughtiness

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Poor filtering capacity, slope
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and state guidelines.

Dwellings

Suitability: Poorly suited in the less sloping areas; generally unsuited in other areas
Major management concerns: Slope, water erosion, soil blowing, cutbanks caving
Management considerations:
• Onsite investigation is needed.
• In the less sloping areas, buildings can be designed so that they conform to the natural slope of the land. The slope can be modified by cutting and filling.
• Seeding and mulching exposed areas can help to control water erosion and soil blowing during and after construction.
• In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: VIIs
Woodland ordination symbol: 8R (red pine)
Primary forest habitat type: PMV
Secondary forest habitat type: AQV

PnB—Pence sandy loam, 0 to 6 percent slopes

Setting

Landform: Outwash plains, stream terraces, eskers, and kames
Landscape position: Toeslopes, side slopes, and linear and slightly convex summits
Shape of areas: Irregular
Size of areas: 5 to 300 acres

Representative Profile

Organic layer:
0 to 1 inch—black, very friable muck

Mineral surface layer:
1 to 6 inches—brown, very friable sandy loam

Subsoil:
6 to 17 inches—dark brown and brown, friable sandy loam
17 to 22 inches—reddish brown, very friable loamy sand

Substratum:
22 to 60 inches—yellowish red, gravelly coarse sand

Composition

Pence soil and similar inclusions: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
- The moderately well drained Manitowish soils
- The well drained Padus and moderately well drained Tipler soils, which are deeper to sandy or sandy and gravelly glacial outwash than the Pence soil
- The excessively drained Vilas soils, which are sandy throughout
- The somewhat poorly drained Wormet soils in depressions
- Areas of stratified sandy, loamy, and silty deposits
- Soils in which the substratum has pockets of sandy loam, loamy sand, gravelly sandy loam, or gravelly loamy sand
- Areas that have stones and boulders on the surface
- Sloping areas of Pence soils

Similar inclusions:
- Areas of soils in which the upper layers are loamy sand, fine sandy loam, or loam
- Soils that are eroded
- Soils that have a substratum of stratified sand, coarse sand, gravelly sand, gravelly coarse sand, very gravelly sand, or very gravelly coarse sand

Soil Properties and Qualities

Drainage class: Somewhat excessively drained
Depth class: Very deep
Permeability: Moderate or moderately rapid in the upper part and moderately rapid to very rapid in the lower part
Available water capacity: Low
Organic matter content: Very high in the organic layer and moderately low or moderate in the mineral surface layer

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other uses—cropland, pasture

Woodland

Suitability: Suited
Major management concerns: No major soil limitations or hazards

Cropland

Suitability: Moderately well suited
Major management concerns: Water erosion, soil blowing, droughtiness, nutrient and pesticide loss
Management considerations:
- A conservation tillage system that leaves crop residue on the surface, contour stripcropping, and crop rotations that include close-growing crops help to control water erosion in the more sloping areas.
- Grassed waterways, diversions, and grade-stabilization structures help to prevent gully erosion and erosion from concentrated flow.
- Field windbreaks, wind stripcropping, a cover of crop residue, and a winter cover crop reduce the hazard of soil blowing and help to prevent the damage to plants caused by windblown sand.
- Crop yields are limited during most years by the restricted available water capacity. Irrigation can improve productivity.
- Crop residue management, additions of organic material, conservation tillage, and field windbreaks increase the water-holding capacity and conserve moisture. Reducing plant populations helps to ensure adequate moisture for all plants.
- Providing protection from water erosion, reducing chemical applications, and incorporating phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.
- Properly scheduling irrigation, reducing chemical applications, and providing split applications of nitrogen fertilizer at recommended rates during the growing season can reduce leaching losses and protect the quality of ground water.

Pasture

Suitability: Well suited
Major management concerns: Water erosion, soil blowing, droughtiness, nutrient and pesticide loss
Management considerations:
- Establishing a high-quality cover of grasses and legumes can reduce the hazards of water erosion and soil blowing.
- Overgrazing depletes the plant cover, increases the hazards of water erosion and soil blowing, and increases the extent of undesirable plant species.
- Forage yields are limited during most years by the restricted available water capacity. Drought-tolerant species are best suited to this soil.
- Restricting grazing during dry periods helps to maintain a high-quality cover of pasture plants.
- Reducing chemical applications and applying nitrogen fertilizer at recommended rates can reduce leaching losses and protect the quality of ground water.
- Reducing chemical applications and applying phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Poor filtering capacity

Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and state guidelines.

Dwellings

Suitability: Well suited
Major management concerns: Dwellings without basements—water erosion, soil blowing; dwellings with basements—water erosion, soil blowing, cutbanks caving
Management considerations:
• Onsite investigation is needed.
• Seeding and mulching exposed areas can help to control water erosion and soil blowing during and after construction.
• In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: IIIe
Woodland ordination symbol: 3A (sugar maple)
Primary forest habitat type: ATM
Secondary forest habitat type: PMV

PnC—Pence sandy loam, 6 to 15 percent slopes

Setting

Landform: Outwash plains, stream terraces, eskers, and kames
Landscape position: Side slopes
Shape of areas: Irregular or long and narrow
Size of areas: 5 to 240 acres

Representative Profile

Organic layer:
0 to 2 inches—black, very friable mucky peat

Mineral surface layer:
2 to 4 inches—dark reddish gray, friable sandy loam

Subsoil:
4 to 16 inches—dark reddish brown and reddish brown, friable sandy loam
16 to 22 inches—strong brown, friable loamy sand

Substratum:
22 to 62 inches—strong brown, loose gravelly sand

Composition

Pence soil and similar inclusions: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The well drained Padus soils, which are deeper to sandy or sandy and gravelly glacial outwash than the Pence soil
• The excessively drained Vilas soils, which are sandy throughout
• Areas of stratified sandy, loamy, and silty deposits
• Soils in which the substratum has pockets of sandy loam, loamy sand, gravelly sandy loam, or gravelly loamy sand
• Areas that have stones and boulders on the surface
• Areas of wet soils in depressions
• Gently sloping or moderately steep areas of Pence soils

Similar inclusions:
• Areas of soils in which the upper layers are loamy sand, fine sandy loam, or loam
• Soils that are eroded
• Soils that have a substratum of stratified sand, coarse sand, gravelly sand, gravelly coarse sand, very gravelly sand, or very gravelly coarse sand

Soil Properties and Qualities

Drainage class: Somewhat excessively drained
Depth class: Very deep
Permeability: Moderate or moderately rapid in the upper part and moderately rapid to very rapid in the lower part
Available water capacity: Low
Organic matter content: Very high in the organic layer and moderately low or moderate in the mineral surface layer

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other uses—cropland, pasture

Woodland

Suitability: Suited
Major management concerns: Equipment limitation
Management considerations:
• The slope limits the selection of log landing sites. Landings can be established on suitable nearly level or gently sloping adjacent or included soils.

Cropland

Suitability: Poorly suited
Major management concerns: Water erosion, soil blowing, droughtiness, nutrient and pesticide loss
Management considerations:
• A conservation tillage system that leaves crop residue on the surface, contour stripcropping, and

crop rotations that include close-growing crops help to control water erosion.
• Grassed waterways, diversions, and grade-stabilization structures help to prevent gully erosion and erosion from concentrated flow.
• Field windbreaks, wind stripcropping, a cover of crop residue, and a winter cover crop reduce the hazard of soil blowing and help to prevent the damage to plants caused by windblown sand.
• Crop yields are limited during most years by the restricted available water capacity. Irrigation can improve productivity.
• Crop residue management, additions of organic material, conservation tillage, and field windbreaks increase the water-holding capacity and conserve moisture. Reducing plant populations helps to ensure adequate moisture for all plants.
• Providing protection from water erosion, reducing chemical applications, and incorporating phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.
• Properly scheduling irrigation, reducing chemical applications, and providing split applications of nitrogen fertilizer at recommended rates during the growing season can reduce leaching losses and protect the quality of ground water.

Pasture

Suitability: Moderately well suited
Major management concerns: Water erosion, soil blowing, droughtiness, nutrient and pesticide loss
Management considerations:
• Establishing a high-quality cover of grasses and legumes can reduce the hazards of water erosion and soil blowing.
• Overgrazing depletes the plant cover, increases the hazards of water erosion and soil blowing, and increases the extent of undesirable plant species.
• Forage yields are limited during most years by the restricted available water capacity. Drought-tolerant species are best suited to this soil.
• Restricting grazing during dry periods helps to maintain a high-quality cover of pasture plants.
• Reducing chemical applications and applying nitrogen fertilizer at recommended rates can reduce leaching losses and protect the quality of ground water.
• Reducing chemical applications and applying phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Poor filtering capacity, slope
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and state guidelines.

Dwellings

Suitability: Moderately well suited
Major management concerns: Slope, water erosion, soil blowing, cutbanks caving
Management considerations:
• Onsite investigation is needed.
• Buildings can be designed so that they conform to the natural slope of the land. The slope can be modified by cutting and filling.
• Seeding and mulching exposed areas can help to control water erosion and soil blowing during and after construction.
• In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: IVe
Woodland ordination symbol: 3A (sugar maple)
Primary forest habitat type: ATM
Secondary forest habitat type: PMV

PnD—Pence sandy loam, 15 to 35 percent slopes

Setting

Landform: Outwash plains, stream terraces, eskers, and kames
Landscape position: Side slopes
Shape of areas: Irregular or long and narrow
Size of areas: 5 to 200 acres

Representative Profile

Surface layer:
0 to 2 inches—dark brown, very friable sandy loam

Subsurface layer:
2 to 3 inches—brown, very friable sandy loam

Subsoil:
3 to 18 inches—brown, very friable sandy loam
18 to 33 inches—strong brown, very friable gravelly loamy sand

Substratum:
33 to 60 inches—strong brown, loose gravelly sand

Composition

Pence soil and similar inclusions: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
- The well drained Padus soils, which are deeper to sandy or sandy and gravelly outwash than the Pence soil
- The excessively drained Vilas soils, which are sandy throughout
- Areas of stratified sandy, loamy, and silty deposits
- Soils in which the substratum has pockets of sandy loam, loamy sand, gravelly sandy loam, or gravelly loamy sand
- Areas that have stones and boulders on the surface
- Areas of wet soils in depressions
- Gently sloping, sloping, or very steep areas of Pence soils

Similar inclusions:
- Areas of soils in which the upper layers are loamy sand, fine sandy loam, or loam
- Soils that are eroded
- Soils that have a substratum of stratified sand, coarse sand, gravelly sand, gravelly coarse sand, very gravelly sand, or very gravelly coarse sand

Soil Properties and Qualities

Drainage class: Somewhat excessively drained
Depth class: Very deep
Permeability: Moderate or moderately rapid in the upper part and moderately rapid to very rapid in the lower part
Available water capacity: Low
Organic matter content: Moderately low or moderate in the surface layer

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other use—pasture

Woodland

Suitability: Suited
Major management concerns: Equipment limitation, erosion hazard
Management considerations:
- The slope limits the selection of log landing sites. Landings can be established on suitable nearly level or gently sloping adjacent or included soils.
- Because the slope limits the use of conventional equipment, special harvesting and planting methods, such as yarding the logs by cable and planting seedlings by hand, may be needed.
- Carefully locating skid trails and building haul roads on the contour reduce the hazard of erosion and minimize equipment limitations.
- Seeding and mulching exposed areas after logging, sloping road surfaces to remove runoff water, and installing water bars, culverts, and drop structures reduce the hazard of erosion.

Pasture

Suitability: Poorly suited
Major management concerns: Water erosion, soil blowing, droughtiness, nutrient and pesticide loss
Management considerations:
- The steeper areas are generally limited to pasture of existing forage species. Maintaining a high-quality cover of pasture plants can reduce the hazards of water erosion and soil blowing.
- Overgrazing depletes the plant cover, increases the hazards of water erosion and soil blowing, and increases the extent of undesirable plant species.
- Forage yields are limited during most years by the restricted available water capacity. Drought-tolerant species are best suited to this soil.
- Restricting grazing during dry periods helps to maintain a high-quality cover of pasture plants.
- Reducing chemical applications and applying nitrogen fertilizer at recommended rates can reduce leaching losses and protect the quality of ground water.
- Reducing chemical applications and applying phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.

Cropland

Suitability: Generally unsuited because of the slope and the very severe hazard of water erosion

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Poor filtering capacity, slope
Management considerations:
- Onsite investigation is needed. The design of absorption fields should meet local and state guidelines.

Dwellings

Suitability: Poorly suited in the less sloping areas; generally unsuited in other areas

Major management concerns: Slope, water erosion, soil blowing, cutbanks caving
Management considerations:
• Onsite investigation is needed.
• In the less sloping areas, buildings can be designed so that they conform to the natural slope of the land. The slope can be modified by cutting and filling.
• Seeding and mulching exposed areas can help to control water erosion and soil blowing during and after construction.
• In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: VIIe
Woodland ordination symbol: 3R (sugar maple)
Primary forest habitat type: ATM
Secondary forest habitat type: PMV

PsB—Pence-Vilas complex, 0 to 6 percent slopes

Setting

Landform: Outwash plains, stream terraces, eskers, and kames
Landscape position: Toeslopes, side slopes, and linear and slightly convex summits
Shape of areas: Irregular
Size of areas: 5 to 300 acres

Representative Profile

Pence

Surface layer:
0 to 3 inches—very dark gray, very friable sandy loam

Subsurface layer:
3 to 4 inches—reddish gray, very friable sandy loam

Subsoil:
4 to 14 inches—dark reddish brown and brown, very friable sandy loam
14 to 20 inches—strong brown, very friable loamy sand

Substratum:
20 to 60 inches—strong brown and brown, loose gravelly coarse sand

Vilas

Surface layer:
0 to 3 inches—dark brown, very friable loamy sand

Subsurface layer:
3 to 7 inches—brown, very friable loamy sand

Subsoil:
7 to 15 inches—dark brown, very friable loamy sand
15 to 29 inches—brown and strong brown, very friable sand

Substratum:
29 to 60 inches—strong brown, loose sand

Composition

Pence soil and similar inclusions: 55 to 65 percent
Vilas soil and similar inclusions: 25 to 35 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The moderately well drained Croswell and Manitowish soils in the lower landscape positions
• The well drained Padus soils, which have loamy or silty upper layers 24 to 40 inches thick
• Areas of stratified sandy, loamy, and silty deposits
• Soils in which the substratum has pockets of loamy sand, sandy loam, gravelly loamy sand, or gravelly sandy loam
• Areas that have stones and boulders on the surface
• Sloping areas of Pence and Vilas soils

Similar inclusions:
• Areas of soils in which the upper layers are sand, loamy fine sand, fine sandy loam, or loam
• Soils that have a substratum of stratified sand, coarse sand, gravelly sand, gravelly coarse sand, very gravelly sand, or very gravelly coarse sand
• Soils that are eroded

Soil Properties and Qualities

Drainage class: Pence—somewhat excessively drained; Vilas—excessively drained
Depth class: Very deep
Permeability: Pence—moderate or moderately rapid in the upper part and moderately rapid to very rapid in the lower part; Vilas—rapid
Available water capacity: Low
Organic matter content: Moderately low or moderate in the surface layer

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other uses—cropland, pasture

Woodland

Suitability: Suited

Major management concerns: No major soil limitations or hazards

Cropland

Suitability: Poorly suited
Major management concerns: Pence—water erosion, soil blowing, droughtiness, nutrient and pesticide loss; Vilas—soil blowing, droughtiness, nutrient and pesticide loss
Management considerations:
• A conservation tillage system that leaves crop residue on the surface, contour stripcropping, and crop rotations that include close-growing crops help to control water erosion on the Pence soil in the more sloping areas.
• Grassed waterways, diversions, and grade-stabilization structures help to prevent gully erosion and erosion from concentrated flow.
• Field windbreaks, wind stripcropping, a cover of crop residue, and a winter cover crop reduce the hazard of soil blowing and help to prevent the damage to plants caused by windblown sand.
• Crop yields are limited during most years by the restricted available water capacity. Irrigation can improve productivity.
• Crop residue management, additions of organic material, conservation tillage, and field windbreaks increase the water-holding capacity and conserve moisture. Reducing plant populations helps to ensure adequate moisture for all plants.
• In areas of the Pence soil, providing protection from water erosion, reducing chemical applications, and incorporating phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.
• Properly scheduling irrigation, reducing chemical applications, and providing split applications of nitrogen fertilizer at recommended rates during the growing season can reduce leaching losses and protect the quality of ground water.

Pasture

Suitability: Moderately well suited
Major management concerns: Pence—water erosion, soil blowing, droughtiness, nutrient and pesticide loss; Vilas—soil blowing, droughtiness, nutrient and pesticide loss
Management considerations:
• Establishing a high-quality cover of grasses and legumes can reduce the hazards of water erosion and soil blowing.
• Overgrazing depletes the plant cover, increases the hazards of water erosion and soil blowing, and increases the extent of undesirable plant species.
• Forage yields are limited during most years by the restricted available water capacity. Drought-tolerant species are best suited to these soils.
• Restricting grazing during dry periods helps to maintain a high-quality cover of pasture plants.
• Reducing chemical applications and applying nitrogen fertilizer at recommended rates can reduce leaching losses and protect the quality of ground water.
• In areas of the Pence soil, reducing chemical applications and applying phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Poor filtering capacity
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and state guidelines.

Dwellings without basements

Suitability: Well suited
Major management concerns: Pence—water erosion, soil blowing; Vilas—soil blowing
Management considerations:
• Onsite investigation is needed.
• Seeding and mulching exposed areas can help to control water erosion and soil blowing during and after construction.

Dwellings with basements

Suitability: Well suited
Major management concerns: Pence—water erosion, soil blowing, cutbanks caving; Vilas—soil blowing, cutbanks caving
Management considerations:
• Onsite investigation is needed.
• Seeding and mulching exposed areas can help to control water erosion and soil blowing during and after construction.
• In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: IVs
Woodland ordination symbol: Pence—3A (sugar maple); Vilas—6A (red pine)
Primary forest habitat type: ATM
Secondary forest habitat type: PMV or AQV

PsC—Pence-Vilas complex, 6 to 15 percent slopes

Setting

Landform: Outwash plains, stream terraces, eskers, and kames
Landscape position: Side slopes
Shape of areas: Irregular or long and narrow
Size of areas: 5 to 200 acres

Representative Profile

Pence

Surface layer:
0 to 2 inches—dark brown, very friable sandy loam

Subsurface layer:
2 to 3 inches—brown, very friable sandy loam

Subsoil:
3 to 16 inches—brown, very friable sandy loam
16 to 21 inches—strong brown, very friable gravelly loamy sand

Substratum:
21 to 60 inches—brown, loose gravelly coarse sand

Vilas

Organic layer:
0 to 1 inch—black, very friable muck

Mineral surface layer:
1 to 4 inches—reddish gray, very friable loamy sand

Subsoil:
4 to 15 inches—dark reddish brown and brown, very friable loamy sand
15 to 23 inches—strong brown, very friable sand

Substratum:
23 to 60 inches—strong brown, loose sand

Composition

Pence soil and similar inclusions: 55 to 65 percent
Vilas soil and similar inclusions: 25 to 35 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
- The well drained Padus soils, which have loamy or silty upper layers 24 to 40 inches thick
- Areas of stratified sandy, loamy, and silty deposits
- Areas of wet soils in depressions
- Areas that have stones and boulders on the surface
- Soils in which the substratum has pockets of loamy sand, sandy loam, gravelly loamy sand, or gravelly sandy loam
- Gently sloping or moderately steep areas of Pence and Vilas soils

Similar inclusions:
- Areas of soils in which the upper layers are sand, loamy fine sand, fine sandy loam, or loam
- Soils that have a substratum of stratified sand, coarse sand, gravelly sand, gravelly coarse sand, very gravelly sand, or very gravelly coarse sand
- Soils that are eroded

Soil Properties and Qualities

Drainage class: Pence—somewhat excessively drained; Vilas—excessively drained
Depth class: Very deep
Permeability: Pence—moderate or moderately rapid in the upper part and moderately rapid to very rapid in the lower part; Vilas—rapid
Available water capacity: Low
Organic matter content: Pence—moderately low or moderate in the surface layer; Vilas—very high in the organic layer and moderately low or moderate in the mineral surface layer

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other uses—cropland, pasture

Woodland

Suitability: Suited
Major management concerns: Equipment limitation
Management considerations:
- The slope limits the selection of log landing sites. Landings can be established on suitable nearly level or gently sloping adjacent or included soils.

Cropland

Suitability: Poorly suited
Major management concerns: Water erosion, soil blowing, droughtiness, nutrient and pesticide loss
Management considerations:
- A conservation tillage system that leaves crop residue on the surface, contour stripcropping, and crop rotations that include close-growing crops help to control water erosion.
- Grassed waterways, diversions, and grade-stabilization structures help to prevent gully erosion and erosion from concentrated flow.
- Field windbreaks, wind stripcropping, a cover of crop residue, and a winter cover crop reduce the hazard of soil blowing and help to prevent the damage to plants caused by windblown sand.
- Crop yields are limited during most years by the

restricted available water capacity. Irrigation can improve productivity.
• Crop residue management, additions of organic material, conservation tillage, and field windbreaks increase the water-holding capacity and conserve moisture. Reducing plant populations helps to ensure adequate moisture for all plants.
• Providing protection from water erosion, reducing chemical applications, and incorporating phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.
• Properly scheduling irrigation, reducing chemical applications, and providing split applications of nitrogen fertilizer at recommended rates during the growing season can reduce leaching losses and protect the quality of ground water.

Pasture

Suitability: Moderately well suited
Major management concerns: Water erosion, soil blowing, droughtiness, nutrient and pesticide loss
Management considerations:
• Establishing a high-quality cover of grasses and legumes can reduce the hazards of water erosion and soil blowing.
• Overgrazing depletes the plant cover, increases the hazards of water erosion and soil blowing, and increases the extent of undesirable plant species.
• Forage yields are limited during most years by the restricted available water capacity. Drought-tolerant species are best suited to these soils.
• Restricting grazing during dry periods helps to maintain a high-quality cover of pasture plants.
• Reducing chemical applications and applying nitrogen fertilizer at recommended rates can reduce leaching losses and protect the quality of ground water.
• Reducing chemical applications and applying phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Poor filtering capacity, slope
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and state guidelines.

Dwellings

Suitability: Moderately well suited
Major management concerns: Slope, water erosion, soil blowing, cutbanks caving
Management considerations:
• Onsite investigation is needed.
• Buildings can be designed so that they conform to the natural slope of the land. The slope can be modified by cutting and filling.
• Seeding and mulching exposed areas can help to control water erosion and soil blowing during and after construction.
• In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: VIs
Woodland ordination symbol: Pence—3A (sugar maple); Vilas—6A (red pine)
Primary forest habitat type: ATM
Secondary forest habitat type: PMV or AQV

PsD—Pence-Vilas complex, 15 to 35 percent slopes

Setting

Landform: Outwash plains, stream terraces, eskers, and kames
Landscape position: Side slopes
Shape of areas: Irregular or long and narrow
Size of areas: 5 to 300 acres

Representative Profile

Pence

Surface layer:
0 to 2 inches—black, very friable sandy loam

Subsurface layer:
2 to 6 inches—pinkish gray, very friable sandy loam

Subsoil:
6 to 15 inches—dark brown and brown, very friable sandy loam
15 to 20 inches—brown, very friable loamy sand

Substratum:
20 to 60 inches—brown and dark yellowish brown, loose gravelly coarse sand

Vilas

Surface layer:
0 to 2 inches—dark reddish brown, very friable loamy sand

Subsurface layer:
2 to 3 inches—reddish gray, very friable loamy sand

Subsoil:
3 to 14 inches—dark reddish brown and dark brown, very friable loamy sand
14 to 23 inches—brown, very friable sand

Substratum:
23 to 60 inches—strong brown, loose sand

Composition

Pence soil and similar inclusions: 55 to 65 percent
Vilas soil and similar inclusions: 25 to 35 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The well drained Padus soils, which have loamy or silty upper layers 24 to 40 inches thick
• Areas of stratified sandy, loamy, and silty deposits
• Areas of wet soils in depressions
• Soils in which the substratum has pockets of loamy sand, sandy loam, gravelly sandy loam, or gravelly loamy sand
• Areas that have stones and boulders on the surface
• Gently sloping, sloping, or very steep areas of Pence and Vilas soils

Similar inclusions:
• Areas of soils in which the upper layers are sand, loamy fine sand, fine sandy loam, or loam
• Soils that have a substratum of stratified sand, coarse sand, gravelly sand, gravelly coarse sand, very gravelly sand, or very gravelly coarse sand
• Soils that are eroded

Soil Properties and Qualities

Drainage class: Pence—somewhat excessively drained; Vilas—excessively drained
Depth class: Very deep
Permeability: Pence—moderate or moderately rapid in the upper part and moderately rapid to very rapid in the lower part; Vilas—rapid
Available water capacity: Low
Organic matter content: Moderately low or moderate in the surface layer

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other use—pasture

Woodland

Suitability: Suited
Major management concerns: Equipment limitation, erosion hazard
Management considerations:
• The slope limits the selection of log landing sites. Landings can be established on suitable nearly level or gently sloping adjacent or included soils.
• Because the slope limits the use of conventional equipment, special harvesting and planting methods, such as yarding the logs by cable and planting seedlings by hand, may be needed.
• Carefully locating skid trails and building haul roads on the contour reduce the hazard of erosion and minimize equipment limitations.
• Seeding and mulching exposed areas after logging, sloping road surfaces to remove runoff water, and installing water bars, culverts, and drop structures reduce the hazard of erosion.

Pasture

Suitability: Poorly suited
Major management concerns: Water erosion, soil blowing, droughtiness, nutrient and pesticide loss
Management considerations:
• The steeper areas are generally limited to pasture of existing forage species. Maintaining a high-quality cover of pasture plants can reduce the hazards of water erosion and soil blowing.
• Overgrazing depletes the plant cover, increases the hazards of water erosion and soil blowing, and increases the extent of undesirable plant species.
• Forage yields are limited during most years by the restricted available water capacity. Drought-tolerant species are best suited to these soils.
• Restricting grazing during dry periods helps to maintain a high-quality cover of pasture plants.
• Reducing chemical applications and applying nitrogen fertilizer at recommended rates can reduce leaching losses and protect the quality of ground water.
• Reducing chemical applications and applying phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.

Cropland

Suitability: Generally unsuited because of the slope, droughtiness, and the very severe hazard of water erosion

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Poor filtering capacity, slope
Management considerations:
• Onsite investigation is needed. The design of

absorption fields should meet local and state guidelines.

Dwellings

Suitability: Poorly suited in the less sloping areas; generally unsuited in other areas
Major management concerns: Slope, water erosion, soil blowing, cutbanks caving
Management considerations:
- Onsite investigation is needed.
- In the less sloping areas, buildings can be designed so that they conform to the natural slope of the land. The slope can be modified by cutting and filling.
- Seeding and mulching exposed areas can help to control water erosion and soil blowing during and after construction.
- In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: VIIe
Woodland ordination symbol: Pence—3R (sugar maple); Vilas—6R (red pine)
Primary forest habitat type: ATM
Secondary forest habitat type: PMV or AQV

Pt—Pits, gravel

Setting

Landform: Outwash plains, stream terraces, eskers, kames, drumlins, and moraines
Shape of areas: Irregular, round, or oblong
Size of areas: 5 to 70 acres

General Description

- This map unit consists of pits where sand, sand and gravel, glacial till, or glacial drift has been removed to a depth of at least several feet and includes adjacent areas where sand, sand and gravel, or other soil material has been stockpiled. Typically, the actively mined pits are not vegetated. Abandoned pits are covered with trees, brush, and weeds. The material remaining on the bottom and side walls of the pits is sand, sand and gravel, or sandy or loamy glacial till or glacial drift.

Composition

Pits and similar inclusions: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Inclusions

Contrasting inclusions:
- Areas of water
- Access roads and buildings
- Areas of wet soils on the bottom of the pits
- Piles of discarded nonsoil material, such as old machinery or stones and boulders that are too large to be crushed

Similar inclusions:
- Pits where silty soil material has been removed for use as fill material

Use and Management

Land uses:
- This unit is used dominantly as actively excavated gravel pits. Some pits have been abandoned and are covered with trees, brush, and weeds, which provide good wildlife habitat. A few abandoned pits are used for dirt bike trails or as firing ranges, and some are used as sanitary landfills.
- Because of the variable nature of this map unit, onsite investigation is needed to determine the suitability for proposed uses. Land shaping and the addition of suitable topsoil are commonly required before a plant cover can be established.

Interpretive Groups

Land capability classification: VIIIs
Woodland ordination symbol: Not assigned
Primary forest habitat type: Not assigned

RuD—Rubicon loamy sand, 15 to 35 percent slopes

Setting

Landform: Outwash plains, stream terraces, and kames
Landscape position: Side slopes
Shape of areas: Irregular or long and narrow
Size of areas: 5 to 240 acres

Representative Profile

Surface layer:
0 to 1 inch—black, very friable loamy sand

Subsurface layer:
1 to 4 inches—brown, very friable loamy sand

Subsoil:
4 to 15 inches—brown, very friable sand
15 to 25 inches—dark yellowish brown, very friable sand

Substratum:
25 to 60 inches—yellowish brown, loose sand

Composition

Rubicon soil and similar inclusions: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The somewhat excessively drained Pence soils, which have loamy upper layers underlain by sandy and gravelly glacial outwash
• Areas of wet soils in depressions
• Areas that have stones and boulders on the surface
• Areas of stratified sandy and loamy deposits
• Gently sloping, sloping, or very steep areas of Rubicon soils

Similar inclusions:
• Areas of soils in which the upper layers are sand, loamy fine sand, sandy loam, or fine sandy loam
• Soils in which the upper layers of loamy sand are as much as 40 inches thick
• Soils in which the substratum has strata of gravelly sand or gravelly coarse sand
• Soils that are eroded

Soil Properties and Qualities

Drainage class: Excessively drained
Depth class: Very deep
Permeability: Rapid
Available water capacity: Low
Organic matter content: Low or moderately low in the surface layer

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other use—pasture

Woodland

Suitability: Suited
Major management concerns: Equipment limitation, erosion hazard, seedling mortality
Management considerations:
• The slope limits the selection of log landing sites. Landings can be established on suitable nearly level or gently sloping adjacent or included soils.
• Because the slope limits the use of conventional equipment, special harvesting and planting methods, such as yarding the logs by cable and planting seedlings by hand, may be needed.
• Carefully locating skid trails and building haul roads on the contour reduce the hazard of erosion and minimize equipment limitations.
• The sandy surface layer can interfere with the traction of wheeled equipment, especially during dry periods.
• Seeding and mulching exposed areas after logging, sloping road surfaces to remove runoff water, and installing water bars, culverts, and drop structures reduce the hazard of erosion.
• Seedling mortality can be minimized by using harvest methods that leave some mature trees to provide shade and protection and by planting vigorous nursery stock in the early spring, when the soil is moist.

Pasture

Suitability: Poorly suited
Major management concerns: Water erosion, soil blowing, droughtiness, nutrient and pesticide loss
Management considerations:
• The steeper areas are generally limited to pasture of existing forage species. Maintaining a high-quality cover of pasture plants can reduce the hazards of water erosion and soil blowing.
• Overgrazing depletes the plant cover, increases the hazards of water erosion and soil blowing, and increases the extent of undesirable plant species.
• Forage yields are limited during most years by the restricted available water capacity. Drought-tolerant species are best suited to this soil.
• Restricting grazing during dry periods helps to maintain a high-quality cover of pasture plants.
• Reducing chemical applications and applying nitrogen fertilizer at recommended rates can reduce leaching losses and protect the quality of ground water.
• Reducing chemical applications and applying phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.

Cropland

Suitability: Generally unsuited because of droughtiness, the slope, and the very severe hazard of water erosion

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Poor filtering capacity, slope
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and state guidelines.

Dwellings

Suitability: Poorly suited in the less sloping areas; generally unsuited in other areas

Major management concerns: Slope, water erosion, soil blowing, cutbanks caving
Management considerations:
• Onsite investigation is needed.
• In the less sloping areas, buildings can be designed so that they conform to the natural slope of the land. The slope can be modified by cutting and filling.
• Seeding and mulching exposed areas can help to control water erosion and soil blowing during and after construction.
• In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: VIIs
Woodland ordination symbol: 4R (quaking aspen)
Primary forest habitat type: QAE
Secondary forest habitat type: AQV

SoD—Soperton-Goodman silt loams, 15 to 35 percent slopes, very stony

Setting

Landform: Drumlins and moraines
Landscape position: Side slopes
Shape of areas: Irregular or long and narrow
Size of areas: 5 to 250 acres

Representative Profile

Soperton

Organic layer:
0 to 1 inch—black, very friable muck

Mineral surface layer:
1 to 6 inches—dark brown, friable silt loam

Subsurface layer:
6 to 8 inches—brown, friable silt loam

Subsoil:
8 to 21 inches—brown, friable silt loam
21 to 29 inches—brown, friable gravelly sandy loam
29 to 37 inches—brown, firm gravelly sandy loam
37 to 46 inches—brown, friable gravelly sandy loam

Substratum:
46 to 61 inches—brown, friable gravelly loamy sand

Goodman

Organic layer:
0 to 1 inch—very dark grayish brown, very friable mucky peat

Mineral surface layer:
1 to 3 inches—black, friable silt loam

Subsurface layer:
3 to 5 inches—dark grayish brown, friable silt loam

Subsoil:
5 to 19 inches—brown and pale brown, friable silt loam
19 to 25 inches—brown, friable silt loam
25 to 41 inches—strong brown, friable sandy loam
41 to 51 inches—brown, very friable loamy sand

Substratum:
51 to 61 inches—brown, very friable loamy sand

Composition

Soperton soil and similar inclusions: 45 to 55 percent
Goodman soil and similar inclusions: 35 to 45 percent
Contrasting inclusions: 5 to 20 percent

Inclusions

Contrasting inclusions:
• The moderately well drained Goodwit and Wabeno soils
• Padus and Stambaugh soils and the somewhat excessively drained Pence soils, all of which are underlain by sandy or sandy and gravelly glacial outwash
• Areas of stratified sandy, loamy, and silty deposits
• Areas of wet soils in depressions
• Areas of Goodman and Soperton soils that are nonstony or are bouldery
• Gently sloping, sloping, or very steep areas of Goodman and Soperton soils

Similar inclusions:
• Areas of soils in which the upper layers are sandy loam, fine sandy loam, very fine sandy loam, or loam
• Soils that have a substratum of sandy loam or gravelly sandy loam
• Soils in which the silty deposits are as much as 60 inches thick

Soil Properties and Qualities

Drainage class: Well drained
Depth class: Soperton—moderately deep to a fragipan; Goodman—very deep
Permeability: Soperton—moderate in the upper part, slow in the fragipan, and moderate or moderately rapid in the lower part; Goodman—moderate in the upper part and moderate or moderately rapid in the lower part
Available water capacity: Soperton—low or moderate; Goodman—moderate or high

Organic matter content: Very high in the organic layer and moderate in the mineral surface layer
Percent of surface covered by stones: About 0.1 to 3.0

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other use—pasture

Woodland

Suitability: Suited
Major management concerns: Soperton—equipment limitation, erosion hazard, windthrow hazard, plant competition; Goodman—equipment limitation, erosion hazard, plant competition
Management considerations:
• The slope limits the selection of log landing sites. Landings can be established on suitable nearly level or gently sloping adjacent or included soils.
• Because the slope limits the use of conventional equipment, special harvesting and planting methods, such as yarding the logs by cable and planting seedlings by hand, may be needed.
• Carefully locating skid trails and building haul roads on the contour reduce the hazard of erosion and minimize equipment limitations.
• Ruts form easily on unsurfaced roads during wet periods. Log landings and haul roads can be stabilized with gravel.
• Seeding and mulching exposed areas after logging, sloping road surfaces to remove runoff water, and installing water bars, culverts, and drop structures reduce the hazard of erosion.
• Windthrow on the Soperton soil can be minimized by using harvest methods that do not leave the remaining trees widely spaced. The periodic salvaging of windthrown trees may be needed.
• Plant competition can be controlled by mechanical site preparation or by limited use of herbicides.

Pasture

Suitability: Poorly suited
Major management concerns: Soperton—water erosion, droughtiness, nutrient and pesticide loss, rock fragments; Goodman—water erosion, nutrient and pesticide loss, rock fragments
Management considerations:
• The steeper areas are generally limited to pasture of existing forage species. Maintaining a high-quality cover of pasture plants can reduce the hazard of water erosion.
• Overgrazing depletes the plant cover, increases the hazard of water erosion, and increases the extent of undesirable plant species.
• Forage yields on the Soperton soil are limited during most years by the restricted available water capacity. Drought-tolerant species are best suited to this soil.
• Restricting grazing during dry periods helps to maintain a high-quality cover of pasture plants.
• Reducing chemical applications and applying phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.
• Surface stones may interfere with the use of machinery.

Cropland

Suitability: Generally unsuited because of surface stones, the slope, and the very severe hazard of water erosion

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Restricted permeability, slope
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and state guidelines.

Dwellings

Suitability: Poorly suited in the less sloping areas; generally unsuited in other areas
Major management concerns: Slope, water erosion, cutbanks caving
Management considerations:
• Onsite investigation is needed.
• In the less sloping areas, buildings can be designed so that they conform to the natural slope of the land. The slope can be modified by cutting and filling.
• Seeding and mulching exposed areas can help to control water erosion during and after construction.
• In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: VIIe in very stony areas; VIe in nonstony areas
Woodland ordination symbol: 3R (sugar maple)
Primary forest habitat type: AViO
Secondary forest habitat type: ATD or ATM

SpD—Soperton-Mudlake silt loams, 1 to 35 percent slopes, very stony

Setting

Landform: Drumlins and moraines
Landscape position: Soperton—side slopes; Mudlake—depressions, drainageways, toeslopes, and footslopes
Slope range: Soperton—15 to 35 percent; Mudlake—1 to 6 percent
Shape of areas: Long and narrow
Size of areas: 5 to 160 acres

Representative Profile

Soperton

Organic layer:
0 to 1 inch—black, very friable muck

Mineral surface layer:
1 to 4 inches—brown, very friable silt loam

Subsoil:
4 to 32 inches—brown, friable silt loam
32 to 39 inches—brown, firm sandy loam
39 to 47 inches—brown, friable gravelly loamy sand

Substratum:
47 to 61 inches—brown, friable gravelly loamy sand

Mudlake

Surface layer:
0 to 3 inches—very dark gray, very friable silt loam

Subsurface layer:
3 to 6 inches—brown, very friable silt loam

Subsoil:
6 to 28 inches—brown, mottled, friable silt loam
28 to 39 inches—dark yellowish brown and brown, mottled, friable sandy loam
39 to 49 inches—dark yellowish brown, mottled, friable gravelly sandy loam

Substratum:
49 to 60 inches—yellowish brown, mottled, friable gravelly loamy sand

Composition

Soperton soil and similar inclusions: 55 to 65 percent
Mudlake soil and similar inclusions: 25 to 35 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
- The poorly drained Capitola soils in the lower depressions and drainageways
- Gastrow soils, which are underlain by stratified lacustrine deposits
- The moderately well drained Goodwit and Wabeno soils
- Padus and Stambaugh soils and the somewhat excessively drained Pence soils, all of which are underlain by sandy or sandy and gravelly glacial outwash
- Areas of Mudlake and Soperton soils that are nonstony or are bouldery
- Gently sloping, sloping, or very steep areas of Soperton soils

Similar inclusions:
- Areas of soils in which the upper layers are loam, very fine sandy loam, fine sandy loam, or sandy loam
- Soils that have a substratum of loamy sand, sandy loam, or gravelly sandy loam
- Soils that have an apparent seasonal high water table
- Soils in which the silty deposits are as much as 60 inches thick

Soil Properties and Qualities

Drainage class: Soperton—well drained; Mudlake—somewhat poorly drained
Seasonal high water table: Mudlake—perched, 0.5 foot to 2.0 feet below the surface
Depth class: Soperton—moderately deep to a fragipan; Mudlake—very deep
Permeability: Soperton—moderate in the upper part, slow in the fragipan, and moderate or moderately rapid in the lower part; Mudlake—moderate in the upper part and moderate or moderately rapid in the lower part
Available water capacity: Soperton—low or moderate; Mudlake—moderate or high
Organic matter content: Soperton—very high in the organic layer and moderate in the mineral surface layer; Mudlake—moderate in the surface layer
Percent of surface covered by stones: About 0.1 to 3.0

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other use—pasture

Woodland

Suitability: Suited
Major management concerns: Soperton—equipment limitation, erosion hazard, windthrow hazard, plant competition; Mudlake—equipment limitation, windthrow hazard, plant competition, seedling mortality
Management considerations:
- In areas of the Mudlake soil, wetness and low soil

strength frequently limit access by machinery to the dry summer months or to periods when the soil is frozen or snow cover is thick.
• In areas of the Soperton soil, the slope limits the selection of log landing sites. Landings can be established on suitable nearly level or gently sloping adjacent or included soils.
• Because the slope limits the use of conventional equipment in areas of the Soperton soil, special harvesting and planting methods, such as yarding the logs by cable and planting seedlings by hand, may be needed.
• Carefully locating skid trails and building haul roads on the contour reduce the hazard of erosion and minimize equipment limitations in areas of the Soperton soil.
• Ruts form easily on unsurfaced roads during wet periods. Log landings and haul roads can be stabilized with gravel.
• Seeding and mulching exposed areas after logging, sloping road surfaces to remove runoff water, and installing water bars, culverts, and drop structures reduce the hazard of erosion in areas of the Soperton soil.
• Windthrow can be minimized by using harvest methods that do not leave the remaining trees widely spaced. The periodic salvaging of windthrown trees may be needed.
• Plant competition can be controlled by mechanical site preparation or by limited use of herbicides.
• Seedling mortality on the Mudlake soil can be minimized by planting vigorous nursery stock on the crest of cradle-knolls or on prepared ridges.

Pasture

Suitability: Poorly suited
Major management concerns: Soperton—water erosion, droughtiness, nutrient and pesticide loss, rock fragments; Mudlake—rock fragments, low strength
Management considerations:
• The steeper areas of the Soperton soil are generally limited to pasture of existing forage species. Maintaining a high-quality cover of pasture plants can reduce the hazard of water erosion.
• Overgrazing depletes the plant cover, increases the hazard of water erosion, and increases the extent of undesirable plant species.
• Forage yields on the Soperton soil are limited during most years by the restricted available water capacity. Drought-tolerant species are best suited to this soil.
• Restricting grazing during dry periods helps to maintain a high-quality cover of pasture plants.
• In areas of the Soperton soil, reducing chemical applications and applying phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.
• Surface stones may interfere with the use of machinery.
• Low strength restricts the use of machinery in areas of the Mudlake soil.

Cropland

Suitability: Generally unsuited because of surface stones, the slope, and the very severe hazard of water erosion (in areas of the Soperton soil)

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Soperton—restricted permeability, slope; Mudlake—restricted permeability, wetness
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and state guidelines.

Dwellings without basements

Suitability: Soperton—poorly suited in the less sloping areas and generally unsuited in other areas; Mudlake—poorly suited
Major management concerns: Soperton—slope, water erosion, cutbanks caving; Mudlake—wetness, water erosion
Management considerations:
• Onsite investigation is needed.
• Installing a subsurface drainage system and adding fill material to raise the elevation of the site help to overcome the wetness in areas of the Mudlake soil.
• In the less sloping areas of the Soperton soil, buildings can be designed so that they conform to the natural slope of the land. The slope can be modified by cutting and filling.
• Seeding and mulching exposed areas can help to control water erosion during and after construction.
• In excavated or cut and fill areas of the Soperton soil, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Dwellings with basements

Suitability: Soperton—poorly suited in the less sloping areas and generally unsuited in other areas; Mudlake—poorly suited
Major management concerns: Soperton—slope, water erosion, cutbanks caving; Mudlake—wetness, water erosion, cutbanks caving

Management considerations:
- Onsite investigation is needed.
- Installing a subsurface drainage system and adding fill material to raise the elevation of the site help to overcome the wetness in areas of the Mudlake soil.
- In the less sloping areas of the Soperton soil, buildings can be designed so that they conform to the natural slope of the land. The slope can be modified by cutting and filling.
- Seeding and mulching exposed areas can help to control water erosion during and after construction.
- In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: VIIe in very stony areas; VIe in nonstony areas
Woodland ordination symbols: Soperton—3R (sugar maple); Mudlake—3W (red maple)
Primary forest habitat type: AViO
Secondary forest habitat types: ATD or ATM

StB—Stambaugh silt loam, 0 to 6 percent slopes

Setting

Landform: Outwash plains and stream terraces
Landscape position: Toeslopes, side slopes, and linear and convex summits
Shape of areas: Irregular
Size of areas: 5 to 200 acres

Representative Profile

Surface layer:
0 to 3 inches—dark brown, friable silt loam

Subsurface layer:
3 to 4 inches—brown, very friable silt loam

Subsoil:
4 to 14 inches—dark brown, very friable silt loam
14 to 31 inches—brown, friable and very friable silt loam
31 to 35 inches—brown, friable gravelly sandy loam

Substratum:
35 to 60 inches—strong brown, loose gravelly sand

Composition

Stambaugh soil and similar inclusions: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
- The moderately well drained Fence soils, which are underlain by stratified lacustrine deposits
- The somewhat excessively drained Pence soils, which have loamy upper layers 10 to 20 inches thick
- The somewhat poorly drained Whisklake soils in depressions
- The moderately well drained Vanzile soils
- Soils that have an apparent seasonal high water table at a depth of 2.5 to 3.5 feet
- Areas that have stones and boulders on the surface
- Soils in which the substratum has pockets of loamy sand, sandy loam, gravelly loamy sand, or gravelly sandy loam
- Sloping areas of Stambaugh soils

Similar inclusions:
- Areas of soils in which the upper layers are very fine sandy loam, fine sandy loam, sandy loam, or loam
- Soils that have little or no gravel in the substratum
- Soils that have a substratum of stratified sand, coarse sand, gravelly sand, gravelly coarse sand, very gravelly sand, or very gravelly coarse sand
- Soils in which the substratum is at a depth of more than 40 inches
- Soils that are eroded

Soil Properties and Qualities

Drainage class: Well drained
Depth class: Very deep
Permeability: Moderate or moderately slow in the solum and very rapid in the substratum
Available water capacity: Moderate
Organic matter content: Moderately low or moderate in the surface layer

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other uses—cropland, pasture

Woodland

Suitability: Suited
Major management concerns: Equipment limitation, plant competition
Management considerations:
- Ruts form easily on unsurfaced roads during wet periods. Log landings and haul roads can be stabilized with gravel.
- Plant competition can be controlled by mechanical site preparation or by limited use of herbicides.

Cropland

Suitability: Well suited (fig. 9)



Figure 9.—Barley in an area of Stambaugh silt loam, 0 to 6 percent slopes. This soil is well suited to use as cropland.

Major management concerns: Water erosion, droughtiness, nutrient and pesticide loss, poor tilth

Management considerations:

- A conservation tillage system that leaves crop residue on the surface, contour stripcropping, and crop rotations that include close-growing crops help to control water erosion in the more sloping areas.
- Grassed waterways, diversions, and grade-stabilization structures help to prevent gully erosion and erosion from concentrated flow.
- Crop yields are somewhat limited during dry years by the restricted available water capacity.
- Crop residue management, additions of organic material, conservation tillage, and field windbreaks increase the water-holding capacity and conserve moisture. Reducing plant populations helps to ensure adequate moisture for all plants.
- Providing protection from water erosion, reducing chemical applications, and incorporating phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.
- Leaving crop residue on the surface or regularly adding other organic material helps to maintain fertility and good tilth and minimizes crusting.

Pasture

Suitability: Well suited

Major management concerns: Water erosion, nutrient and pesticide loss

Management considerations:

- Establishing a high-quality cover of grasses and legumes can reduce the hazard of water erosion.
- Overgrazing depletes the plant cover, increases the hazard of water erosion, and increases the extent of undesirable plant species.
- Reducing chemical applications and applying phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.

Septic tank absorption fields

Severity of soil limitations: Severe

Major restrictive features: Poor filtering capacity, restricted permeability

Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and state guidelines.

Dwellings

Suitability: Well suited
Major management concerns: Dwellings without basements—water erosion; dwellings with basements—water erosion, cutbanks caving
Management considerations:
• Onsite investigation is needed.
• Seeding and mulching exposed areas can help to control water erosion during and after construction.
• In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: IIe
Woodland ordination symbol: 3L (sugar maple)
Primary forest habitat type: AViO
Secondary forest habitat type: ATD

StC—Stambaugh silt loam, 6 to 15 percent slopes

Setting

Landform: Outwash plains and stream terraces
Landscape position: Side slopes
Shape of areas: Irregular
Size of areas: 5 to 200 acres

Representative Profile

Organic layer:
0 to 2 inches—black, very friable muck

Mineral surface layer:
2 to 5 inches—brown, very friable silt loam

Subsoil:
5 to 30 inches—brown and reddish brown, friable silt loam
30 to 35 inches—reddish brown, friable sandy loam

Substratum:
35 to 51 inches—brown, loose gravelly sand
51 to 60 inches—reddish brown, loose very gravelly sand

Composition

Stambaugh soil and similar inclusions: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The somewhat excessively drained Pence soils, which have loamy upper layers 10 to 20 inches thick
• The moderately well drained Vanzile soils in the less sloping areas
• Areas of stratified sandy, loamy, and silty deposits
• Areas of wet soils in depressions
• Areas that have stones and boulders on the surface
• Soils in which the substratum has pockets of loamy sand, sandy loam, gravelly loamy sand, or gravelly sandy loam
• Gently sloping or moderately steep areas of Stambaugh soils

Similar inclusions:
• Areas of soils in which the upper layers are very fine sandy loam, fine sandy loam, sandy loam, or loam
• Soils that have a substratum of stratified sand, coarse sand, gravelly sand, gravelly coarse sand, very gravelly sand, or very gravelly coarse sand
• Soils in which the substratum is at a depth of more than 40 inches
• Soils that are eroded
• Soils that have little or no gravel in the substratum

Soil Properties and Qualities

Drainage class: Well drained
Depth class: Very deep
Permeability: Moderate or moderately slow in the solum and very rapid in the substratum
Available water capacity: Moderate
Organic matter content: Very high in the organic layer and moderately low or moderate in the mineral surface layer

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other uses—cropland, pasture

Woodland

Suitability: Suited
Major management concerns: Equipment limitation, plant competition
Management considerations:
• The slope limits the selection of log landing sites. Landings can be established on suitable nearly level or gently sloping adjacent or included soils.
• Ruts form easily on unsurfaced roads during wet periods. Log landings and haul roads can be stabilized with gravel.
• Plant competition can be controlled by mechanical site preparation or by limited use of herbicides.

Cropland

Suitability: Moderately well suited
Major management concerns: Water erosion, droughtiness, nutrient and pesticide loss, poor tilth
Management considerations:
• A conservation tillage system that leaves crop residue on the surface, contour stripcropping, and crop rotations that include close-growing crops help to control water erosion.
• Grassed waterways, diversions, and grade-stabilization structures help to prevent gully erosion and erosion from concentrated flow.
• Crop yields are somewhat limited during dry years by the restricted available water capacity.
• Crop residue management, additions of organic material, conservation tillage, and field windbreaks increase the water-holding capacity and conserve moisture. Reducing plant populations helps to ensure adequate moisture for all plants.
• Providing protection from water erosion, reducing chemical applications, and incorporating phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.
• Leaving crop residue on the surface or regularly adding other organic material helps to maintain fertility and good tilth and minimizes crusting.

Pasture

Suitability: Well suited
Major management concerns: Water erosion, nutrient and pesticide loss
Management considerations:
• Establishing a high-quality cover of grasses and legumes can reduce the hazard of water erosion.
• Overgrazing depletes the plant cover, increases the hazard of water erosion, and increases the extent of undesirable plant species.
• Reducing chemical applications and applying phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Poor filtering capacity, restricted permeability, slope
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and state guidelines.

Dwellings

Suitability: Moderately well suited
Major management concerns: Slope, water erosion, cutbanks caving
Management considerations:
• Onsite investigation is needed.
• Buildings can be designed so that they conform to the natural slope of the land. The slope can be modified by cutting and filling.
• Seeding and mulching exposed areas can help to control water erosion during and after construction.
• In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: IIIe
Woodland ordination symbol: 3L (sugar maple)
Primary forest habitat type: AViO
Secondary forest habitat type: ATD

StD—Stambaugh silt loam, 15 to 25 percent slopes

Setting

Landform: Outwash plains and stream terraces
Landscape position: Side slopes
Shape of areas: Irregular or long and narrow
Size of areas: 5 to 160 acres

Representative Profile

Surface layer:
0 to 1 inch—black, friable silt loam

Subsurface layer:
1 to 2 inches—brown, friable silt loam

Subsoil:
2 to 29 inches—brown, friable silt loam
29 to 34 inches—strong brown, friable gravelly sandy loam

Substratum:
34 to 60 inches—strong brown, loose very gravelly sand

Composition

Stambaugh soil and similar inclusions: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The somewhat excessively drained Pence soils, which have loamy upper layers 10 to 20 inches thick
• Areas of wet soils in depressions
• Areas that have stones and boulders on the surface

• Areas of stratified sandy, loamy, and silty deposits
• Soils in which the substratum has pockets of loamy sand, sandy loam, gravelly loamy sand, or gravelly sandy loam
• Gently sloping, sloping, or steep areas of Stambaugh soils

Similar inclusions:
• Areas of soils in which the upper layers are very fine sandy loam, fine sandy loam, sandy loam, or loam
• Soils in which the substratum is at a depth of more than 40 inches
• Soils that are eroded
• Soils that have little or no gravel in the substratum
• Soils that have a substratum of stratified sand, coarse sand, gravelly sand, gravelly coarse sand, very gravelly sand, or very gravelly coarse sand

Soil Properties and Qualities

Drainage class: Well drained
Depth class: Very deep
Permeability: Moderate or moderately slow in the solum and very rapid in the substratum
Available water capacity: Moderate
Organic matter content: Moderately low or moderate in the surface layer

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other use—pasture

Woodland

Suitability: Suited
Major management concerns: Equipment limitation, erosion hazard, plant competition
Management considerations:
• The slope limits the selection of log landing sites. Landings can be established on suitable nearly level or gently sloping adjacent or included soils.
• Because the slope limits the use of conventional equipment, special harvesting and planting methods, such as yarding the logs by cable and planting seedlings by hand, may be needed.
• Carefully locating skid trails and building haul roads on the contour reduce the hazard of erosion and minimize equipment limitations.
• Ruts form easily on unsurfaced roads during wet periods. Log landings and haul roads can be stabilized with gravel.
• Seeding and mulching exposed areas after logging, sloping road surfaces to remove runoff water, and installing water bars, culverts, and drop structures reduce the hazard of erosion.
• Plant competition can be controlled by mechanical site preparation or by limited use of herbicides.

Pasture

Suitability: Moderately well suited
Major management concerns: Water erosion, nutrient and pesticide loss
Management considerations:
• The steeper areas are generally limited to pasture of existing forage species. Maintaining a high-quality cover of pasture plants can reduce the hazard of water erosion.
• Overgrazing depletes the plant cover, increases the hazard of water erosion, and increases the extent of undesirable plant species.
• Reducing chemical applications and applying phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.

Cropland

Suitability: Generally unsuited because of the slope and the very severe hazard of water erosion

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Poor filtering capacity, restricted permeability, slope
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and state guidelines.

Dwellings

Suitability: Poorly suited
Major management concerns: Slope, water erosion, cutbanks caving
Management considerations:
• Onsite investigation is needed.
• Buildings can be designed so that they conform to the natural slope of the land. The slope can be modified by cutting and filling.
• Seeding and mulching exposed areas can help to control water erosion during and after construction.
• In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: VIe
Woodland ordination symbol: 3R (sugar maple)
Primary forest habitat type: AViO
Secondary forest habitat type: ATD

TpA—Tipler sandy loam, 0 to 3 percent slopes

Setting

Landform: Outwash plains and stream terraces
Landscape position: Linear areas, toeslopes, and footslopes
Shape of areas: Irregular
Size of areas: 5 to 150 acres

Representative Profile

Surface layer:
0 to 3 inches—dark brown, friable sandy loam

Subsurface layer:
3 to 5 inches—brown, friable sandy loam

Subsoil:
5 to 26 inches—dark brown, brown, and light brown, friable sandy loam
26 to 33 inches—strong brown, mottled, friable sandy loam

Substratum:
33 to 60 inches—brown, mottled, loose, stratified very gravelly coarse sand and gravelly coarse sand

Composition

Tipler soil and similar inclusions: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• Manitowish soils and the somewhat excessively drained Pence soils, which have thinner loamy deposits than those of the Tipler soil
• The well drained Padus soils in the higher landscape positions
• The somewhat poorly drained Worcester soils in depressions
• Soils in which the substratum has pockets of loamy sand, sandy loam, gravelly loamy sand, or gravelly sandy loam
• Areas of stratified sandy, loamy, and silty deposits
• Areas that have stones and boulders on the surface
• Areas of Tipler soils that have slopes of 3 to 6 percent

Similar inclusions:
• Areas of soils in which the upper layers are very fine sandy loam, fine sandy loam, loam, or silt loam
• Soils that have a perched seasonal high water table
• Soils that have a substratum of sand, coarse sand, gravelly sand, gravelly coarse sand, very gravelly sand, or very gravelly coarse sand
• Soils in which the substratum is at a depth of more than 40 inches

Soil Properties and Qualities

Drainage class: Moderately well drained
Seasonal high water table: Apparent, 2.5 to 3.5 feet below the surface
Depth class: Very deep
Permeability: Moderate in the solum and rapid or very rapid in the substratum
Available water capacity: Low or moderate
Organic matter content: Moderate in the surface layer

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other uses—cropland, pasture

Woodland

Suitability: Suited
Major management concerns: Equipment limitation, plant competition
Management considerations:
• Ruts form easily on unsurfaced roads during wet periods. Log landings and haul roads can be stabilized with gravel.
• Plant competition can be controlled by mechanical site preparation or by limited use of herbicides.

Cropland

Suitability: Well suited
Major management concerns: Soil blowing, droughtiness
Management considerations:
• Field windbreaks, wind stripcropping, a cover of crop residue, and a winter cover crop reduce the hazard of soil blowing and help to prevent the damage to plants caused by windblown sand.
• Crop yields are limited during most years by the restricted available water capacity. Irrigation can improve productivity.
• Crop residue management, additions of organic material, conservation tillage, and field windbreaks increase the water-holding capacity and conserve moisture. Reducing plant populations helps to ensure adequate moisture for all plants.

Pasture

Suitability: Well suited
Major management concerns: Soil blowing, droughtiness
Management considerations:
• Establishing a high-quality cover of grasses and legumes can reduce the hazard of soil blowing.
• Overgrazing depletes the plant cover, increases the

hazard of soil blowing, and increases the extent of undesirable plant species.
• Forage yields are limited during most years in areas where the available water capacity of the soil is restricted. Drought-tolerant species are best suited to this soil.
• Restricting grazing during dry periods helps to maintain a high-quality cover of pasture plants.

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Poor filtering capacity, wetness
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and state guidelines.

Dwellings without basements

Suitability: Well suited
Major management concerns: Soil blowing
Management considerations:
• Onsite investigation is needed.
• Seeding and mulching exposed areas can help to control soil blowing during and after construction.

Dwellings with basements

Suitability: Moderately well suited
Major management concerns: Wetness, soil blowing, cutbanks caving
Management considerations:
• Onsite investigation is needed.
• Installing a subsurface drainage system and adding fill material to raise the elevation of the site help to overcome the wetness.
• Seeding and mulching exposed areas can help to control soil blowing during and after construction.
• In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: IIs
Woodland ordination symbol: 3L (sugar maple)
Primary forest habitat type: ATD
Secondary forest habitat type: ATM or AViO

VaB—Vanzile silt loam, 0 to 6 percent slopes

Setting

Landform: Outwash plains and stream terraces
Landscape position: Linear areas, toeslopes, and footslopes
Shape of areas: Irregular
Size of areas: 5 to 200 acres

Representative Profile

Surface layer:
0 to 3 inches—dark brown, friable silt loam

Subsurface layer:
3 to 4 inches—brown, very friable silt loam

Subsoil:
4 to 14 inches—dark brown and brown, very friable silt loam
14 to 26 inches—brown and reddish brown, friable silt loam
26 to 30 inches—dark brown, mottled, friable loam

Substratum:
30 to 60 inches—strong brown, loose, stratified sand and gravelly sand

Composition

Vanzile soil and similar inclusions: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• Fence soils, which are underlain by stratified lacustrine deposits
• The somewhat excessively drained Pence soils, which have loamy upper layers 10 to 20 inches thick
• The well drained Stambaugh soils
• The somewhat poorly drained Whisklake soils in depressions
• Areas that have stones and boulders on the surface
• Soils in which the substratum has pockets of loamy sand, sandy loam, gravelly loamy sand, or gravelly sandy loam
• Soils that have an apparent seasonal high water table at a depth of 2.5 to 3.5 feet
• Sloping areas of Vanzile soils

Similar inclusions:
• Areas of soils in which the upper layers are very fine sandy loam, fine sandy loam, sandy loam, or loam
• Soils in which the substratum is at a depth of more than 40 inches
• Soils that are eroded
• Soils that have a substratum of sand, coarse sand, gravelly sand, gravelly coarse sand, very gravelly sand, or very gravelly coarse sand

Soil Properties and Qualities

Drainage class: Moderately well drained
Seasonal high water table: At a depth of more than 6

feet; mottled zone of seasonal saturation at a depth of 1.5 to 3.5 feet
Depth class: Very deep
Permeability: Moderate or moderately slow in the solum and rapid or very rapid in the substratum
Available water capacity: Moderate
Organic matter content: Moderately low or moderate in the surface layer

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other uses—cropland, pasture

Woodland

Suitability: Suited
Major management concerns: Equipment limitation, plant competition
Management considerations:
• Ruts form easily on unsurfaced roads during wet periods. Log landings and haul roads can be stabilized with gravel.
• Plant competition can be controlled by mechanical site preparation or by limited use of herbicides.

Cropland

Suitability: Well suited
Major management concerns: Water erosion, droughtiness, nutrient and pesticide loss, poor tilth
Management considerations:
• A conservation tillage system that leaves crop residue on the surface, contour stripcropping, and crop rotations that include close-growing crops help to control water erosion in the more sloping areas.
• Grassed waterways, diversions, and grade-stabilization structures help to prevent gully erosion and erosion from concentrated flow.
• Crop yields are somewhat limited during dry years by the restricted available water capacity.
• Crop residue management, additions of organic material, conservation tillage, and field windbreaks increase the water-holding capacity and conserve moisture. Reducing plant populations helps to ensure adequate moisture for all plants.
• Providing protection from water erosion, reducing chemical applications, and incorporating phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.
• Leaving crop residue on the surface or regularly adding other organic material helps to maintain fertility and good tilth and minimizes crusting.

Pasture

Suitability: Well suited
Major management concerns: Water erosion, nutrient and pesticide loss
Management considerations:
• Establishing a high-quality cover of grasses and legumes can reduce the hazard of water erosion.
• Overgrazing depletes the plant cover, increases the hazard of water erosion, and increases the extent of undesirable plant species.
• Reducing chemical applications and applying phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Poor filtering capacity, restricted permeability
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and state guidelines.

Dwellings

Suitability: Well suited
Major management concerns: Dwellings without basements—water erosion; dwellings with basements—water erosion, cutbanks caving
Management considerations:
• Onsite investigation is needed.
• Seeding and mulching exposed areas can help to control water erosion during and after construction.
• In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: IIe
Woodland ordination symbol: 3L (sugar maple)
Primary forest habitat type: AViO
Secondary forest habitat type: ATD

VsB—Vilas loamy sand, 0 to 6 percent slopes

Setting

Landform: Outwash plains, stream terraces, and kames
Landscape position: Toeslopes, side slopes, and linear and slightly convex summits
Shape of areas: Irregular
Size of areas: 5 to 250 acres

Representative Profile

Organic layer:
0 to 1 inch—black, very friable muck

Mineral surface layer:
1 to 3 inches—very dark brown, very friable loamy sand

Subsurface layer:
3 to 4 inches—brown, very friable loamy sand

Subsoil:
4 to 14 inches—reddish brown and brown, very friable loamy sand
14 to 21 inches—reddish yellow, very friable sand

Substratum:
21 to 60 inches—reddish yellow and light brown, loose sand

Composition

Vilas soil and similar inclusions: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The moderately well drained Croswell soils in the lower landscape positions
• The somewhat excessively drained Pence soils, which have loamy upper layers underlain by sandy and gravelly glacial outwash
• Areas of stratified sandy and loamy deposits
• Areas that have stones and boulders on the surface
• Sloping areas of Vilas soils

Similar inclusions:
• Areas of soils in which the upper layers are sand, loamy fine sand, fine sand, sandy loam, or fine sandy loam
• Soils in which the substratum has strata of gravelly sand
• Soils that are eroded

Soil Properties and Qualities

Drainage class: Excessively drained
Depth class: Very deep
Permeability: Rapid
Available water capacity: Low
Organic matter content: Very high in the organic layer and moderately low or moderate in the mineral surface layer

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other uses—cropland, pasture

Woodland

Suitability: Suited
Major management concerns: No major soil limitations or hazards

Cropland

Suitability: Poorly suited
Major management concerns: Soil blowing, droughtiness, nutrient and pesticide loss
Management considerations:
• Field windbreaks, wind stripcropping, a cover of crop residue, and a winter cover crop reduce the hazard of soil blowing and help to prevent the damage to plants caused by windblown sand.
• Crop yields are limited during most years by the restricted available water capacity. Irrigation can improve productivity.
• Crop residue management, additions of organic material, conservation tillage, and field windbreaks increase the water-holding capacity and conserve moisture. Reducing plant populations helps to ensure adequate moisture for all plants.
• Reducing chemical applications and providing split applications of nitrogen fertilizer at recommended rates during the growing season can reduce leaching losses and protect the quality of ground water.
• The proper scheduling of irrigation can minimize the leaching of plant nutrients and other chemicals out of the root zone and into the underlying ground water.

Pasture

Suitability: Moderately well suited
Major management concerns: Soil blowing, droughtiness, nutrient and pesticide loss
Management considerations:
• Establishing a high-quality cover of grasses and legumes can reduce the hazard of soil blowing.
• Overgrazing depletes the plant cover, increases the hazard of soil blowing, and increases the extent of undesirable plant species.
• Forage yields are limited during most years by the restricted available water capacity. Drought-tolerant species are best suited to this soil.
• Restricting grazing during dry periods helps to maintain a high-quality cover of pasture plants.
• Reducing chemical applications and applying nitrogen fertilizer at recommended rates can reduce leaching losses and protect the quality of ground water.

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Poor filtering capacity
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and state guidelines.

Dwellings

Suitability: Well suited

Major management concerns: Dwellings without basements—soil blowing; dwellings with basements—soil blowing, cutbanks caving
Management considerations:
• Onsite investigation is needed.
• Seeding and mulching exposed areas can help to control soil blowing during and after construction.
• In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: IVs
Woodland ordination symbol: 6A (red pine)
Primary forest habitat type: PMV
Secondary forest habitat type: AQV

VsC—Vilas loamy sand, 6 to 15 percent slopes

Setting

Landform: Outwash plains, stream terraces, and kames
Landscape position: Side slopes
Shape of areas: Irregular or long and narrow
Size of areas: 5 to 80 acres

Representative Profile

Organic layer:
0 to 1 inch—black, very friable muck

Mineral surface layer:
1 to 4 inches—brown, very friable loamy sand

Subsoil:
4 to 10 inches—dark brown, very friable loamy sand
10 to 26 inches—brown and strong brown, very friable sand

Substratum:
26 to 60 inches—strong brown, loose sand

Composition

Vilas soil and similar inclusions: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The somewhat excessively drained Pence soils, which have loamy upper layers underlain by sandy and gravelly glacial outwash
• Areas of stratified sandy and loamy deposits
• Areas of wet soils in depressions
• Areas that have stones and boulders on the surface
• Gently sloping or moderately steep areas of Vilas soils

Similar inclusions:
• Areas of soils in which the upper layers are sand, loamy fine sand, fine sand, sandy loam, or fine sandy loam
• Soils in which the substratum has strata of gravelly sand
• Soils that are eroded

Soil Properties and Qualities

Drainage class: Excessively drained
Depth class: Very deep
Permeability: Rapid
Available water capacity: Low
Organic matter content: Very high in the organic layer and moderately low or moderate in the mineral surface layer

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other uses—cropland, pasture

Woodland

Suitability: Suited
Major management concerns: Equipment limitation
Management considerations:
• The slope limits the selection of log landing sites. Landings can be established on suitable nearly level or gently sloping adjacent or included soils.

Cropland

Suitability: Poorly suited
Major management concerns: Water erosion, soil blowing, droughtiness, nutrient and pesticide loss
Management considerations:
• A conservation tillage system that leaves crop residue on the surface, contour stripcropping, and crop rotations that include close-growing crops help to control water erosion.
• Grassed waterways, diversions, and grade-stabilization structures help to prevent gully erosion and erosion from concentrated flow.
• Field windbreaks, wind stripcropping, a cover of crop residue, and a winter cover crop reduce the hazard of soil blowing and help to prevent the damage to plants caused by windblown sand.
• Crop yields are limited during most years by the restricted available water capacity. Irrigation can improve productivity.
• Crop residue management, additions of organic material, conservation tillage, and field windbreaks increase the water-holding capacity and conserve

moisture. Reducing plant populations helps to ensure adequate moisture for all plants.
• Providing protection from water erosion, reducing chemical applications, and incorporating phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.
• Properly scheduling irrigation, reducing chemical applications, and providing split applications of nitrogen fertilizer at recommended rates during the growing season can reduce leaching losses and protect the quality of ground water.

Pasture

Suitability: Moderately well suited
Major management concerns: Water erosion, soil blowing, droughtiness, nutrient and pesticide loss
Management considerations:
• Establishing a high-quality cover of grasses and legumes can reduce the hazards of water erosion and soil blowing.
• Overgrazing depletes the plant cover, increases the hazards of water erosion and soil blowing, and increases the extent of undesirable plant species.
• Forage yields are limited during most years by the restricted available water capacity. Drought-tolerant species are best suited to this soil.
• Restricting grazing during dry periods helps to maintain a high-quality cover of pasture plants.
• Reducing chemical applications and applying nitrogen fertilizer at recommended rates can reduce leaching losses and protect the quality of ground water.
• Reducing chemical applications and applying phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Poor filtering capacity, slope
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and state guidelines.

Dwellings

Suitability: Moderately well suited
Major management concerns: Slope, water erosion, soil blowing, cutbanks caving
Management considerations:
• Onsite investigation is needed.
• Buildings can be designed so that they conform to the natural slope of the land. The slope can be modified by cutting and filling.
• Seeding and mulching exposed areas can help to control water erosion and soil blowing during and after construction.
• In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: VIs
Woodland ordination symbol: 6A (red pine)
Primary forest habitat type: PMV
Secondary forest habitat type: AQV

W—Water

Setting

Landform: Mainly stream terraces, outwash plains, and moraines
Shape of areas: Round or irregular
Size of areas: 2 to 2,160 acres

General Description

• This map unit consists of areas that typically contain water throughout the year.

Composition

Water: 95 to 100 percent
Contrasting inclusions: 0 to 5 percent

Inclusions

Contrasting inclusions:
• Shoreline areas and sandbars exposed during periods of low water
• Areas of floating aquatic vegetation

Use and Management

Land uses: Dominant use—wetland wildlife habitat; other uses—water-based recreation

Interpretive Groups

Land capability classification: Not assigned
Woodland ordination symbol: Not assigned
Primary forest habitat type: Not assigned

WaC—Wabeno-Goodman silt loams, 6 to 15 percent slopes, very stony

Setting

Landform: Drumlins and moraines
Landscape position: Side slopes
Shape of areas: Irregular or long and narrow
Size of areas: 5 to 800 acres

Representative Profile

Wabeno

Surface layer:
0 to 3 inches—dark brown, friable silt loam

Subsurface layer:
3 to 6 inches—brown, friable silt loam

Subsoil:
6 to 27 inches—dark reddish brown, brown, and light brown, friable silt loam
27 to 47 inches—brown and strong brown, mottled, firm sandy loam

Substratum:
47 to 60 inches—reddish brown, friable sandy loam with strata of brown loamy sand

Goodman

Surface layer:
0 to 3 inches—black, very friable silt loam

Subsurface layer:
3 to 4 inches—brown, very friable silt loam

Subsoil:
4 to 27 inches—brown, friable silt loam
27 to 50 inches—brown and strong brown, friable gravelly sandy loam

Substratum:
50 to 60 inches—brown, friable gravelly sandy loam

Composition

Wabeno soil and similar inclusions: 45 to 55 percent
Goodman soil and similar inclusions: 35 to 45 percent
Contrasting inclusions: 5 to 20 percent

Inclusions

Contrasting inclusions:
- Padus and Stambaugh soils and the somewhat excessively drained Pence soils, all of which are underlain by sandy or sandy and gravelly glacial outwash
- Areas of wet soils in depressions
- Areas of Goodman and Wabeno soils that are nonstony or are bouldery
- Gently sloping or moderately steep areas of Goodman and Wabeno soils

Similar inclusions:
- Areas of soils in which the upper layers are sandy loam, fine sandy loam, very fine sandy loam, or loam
- Soils that have a substratum of loamy sand or gravelly loamy sand
- Soils in which the silty deposits are as much as 60 inches thick

Soil Properties and Qualities

Drainage class: Wabeno—moderately well drained; Goodman—well drained
Seasonal high water table: Wabeno—perched, 1.5 to 3.0 feet below the surface
Depth class: Wabeno—moderately deep to a fragipan; Goodman—very deep
Permeability: Wabeno—moderate in the upper part, slow in the fragipan, and moderate in the substratum; Goodman—moderate in the upper part and moderate or moderately rapid in the lower part
Available water capacity: Wabeno—low; Goodman—moderate or high
Organic matter content: Wabeno—moderately low or moderate in the surface layer; Goodman—moderate in the surface layer
Percent of surface covered by stones: About 0.1 to 3.0

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other uses—cropland, pasture

Woodland

Suitability: Suited
Major management concerns: Wabeno—equipment limitation, windthrow hazard, plant competition; Goodman—equipment limitation, plant competition
Management considerations:
- The slope limits the selection of log landing sites. Landings can be established on suitable nearly level or gently sloping adjacent or included soils.
- Ruts form easily on unsurfaced roads during wet periods. Log landings and haul roads can be stabilized with gravel.
- Windthrow on the Wabeno soil can be minimized by using harvest methods that do not leave the remaining trees widely spaced. The periodic salvaging of windthrown trees may be needed.
- Plant competition can be controlled by mechanical site preparation or by limited use of herbicides.

Cropland

Suitability: Moderately well suited in areas where surface stones have been removed; generally unsuited in other areas
Major management concerns: Water erosion, droughtiness, nutrient and pesticide loss, poor tilth, rock fragments

Management considerations:
• A conservation tillage system that leaves crop residue on the surface, contour stripcropping, and crop rotations that include close-growing crops help to control water erosion.
• Grassed waterways, diversions, and grade-stabilization structures help to prevent gully erosion and erosion from concentrated flow.
• Crop yields are somewhat limited during dry years in areas where the available water capacity of the soils is restricted. Irrigation can improve productivity.
• Crop residue management, additions of organic material, conservation tillage, and field windbreaks increase the water-holding capacity and conserve moisture. Reducing plant populations helps to ensure adequate moisture for all plants.
• Providing protection from water erosion, reducing chemical applications, and incorporating phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.
• Leaving crop residue on the surface or regularly adding other organic material helps to maintain fertility and good tilth and minimizes crusting.
• Some areas have stones on the surface. Unless they are removed, the stones interfere with tillage.

Pasture

Suitability: Moderately well suited
Major management concerns: Wabeno—water erosion, droughtiness, nutrient and pesticide loss, rock fragments; Goodman—water erosion, nutrient and pesticide loss, rock fragments
Management considerations:
• Establishing a high-quality cover of grasses and legumes can reduce the hazard of water erosion.
• Overgrazing depletes the plant cover, increases the hazard of water erosion, and increases the extent of undesirable plant species.
• Forage yields on the Wabeno soil are limited during most years by the restricted available water capacity. Drought-tolerant species are best suited to this soil.
• Restricting grazing during dry periods helps to maintain a high-quality cover of pasture plants.
• Reducing chemical applications and applying phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.
• Surface stones may interfere with the use of machinery.

Septic tank absorption fields

Severity of soil limitations: Wabeno—severe; Goodman—moderate
Major restrictive features: Wabeno—restricted permeability, wetness, slope; Goodman—restricted permeability, slope
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and state guidelines.

Dwellings without basements

Suitability: Moderately well suited
Major management concerns: Wabeno—wetness, slope, water erosion, cutbanks caving; Goodman—slope, water erosion, cutbanks caving
Management considerations:
• Onsite investigation is needed.
• In areas of the Wabeno soil, installing a subsurface drainage system and adding fill material to raise the elevation of the site help to overcome the wetness.
• Buildings can be designed so that they conform to the natural slope of the land. The slope can be modified by cutting and filling.
• Seeding and mulching exposed areas can help to control water erosion during and after construction.
• In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Dwellings with basements

Suitability: Wabeno—poorly suited; Goodman—moderately well suited
Major management concerns: Wabeno—wetness, slope, water erosion, cutbanks caving; Goodman—slope, water erosion, cutbanks caving
Management considerations:
• Onsite investigation is needed.
• In areas of the Wabeno soil, installing a subsurface drainage system and adding fill material to raise the elevation of the site help to overcome the wetness.
• Buildings can be designed so that they conform to the natural slope of the land. The slope can be modified by cutting and filling.
• Seeding and mulching exposed areas can help to control water erosion during and after construction.
• In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: VIs in very stony areas; IIIe in nonstony areas
Woodland ordination symbol: 3L (sugar maple)
Primary forest habitat type: AViO
Secondary forest habitat types: ATD or ATM

WbB—Wabeno-Goodwit silt loams, 1 to 6 percent slopes, very stony

Setting

Landform: Drumlins and moraines
Landscape position: Shoulders and linear and slightly convex summits
Shape of areas: Irregular or long and narrow
Size of areas: 5 to 1,500 acres

Representative Profile

Wabeno

Organic layer:
0 to 1 inch—black, very friable muck

Mineral surface layer:
1 to 3 inches—brown, very friable silt loam

Subsoil:
3 to 17 inches—dark brown and brown, friable silt loam
17 to 22 inches—strong brown and brown, mottled, friable loam
22 to 35 inches—brown and dark yellowish brown, mottled, firm sandy loam

Substratum:
35 to 60 inches—brown, friable loamy sand with strata of reddish brown sandy loam

Goodwit

Surface layer:
0 to 3 inches—black, friable silt loam

Subsurface layer:
3 to 5 inches—brown, friable silt loam

Subsoil:
5 to 24 inches—brown, friable silt loam
24 to 32 inches—brown, mottled, friable loam
32 to 45 inches—brown, mottled, friable sandy loam

Substratum:
45 to 60 inches—brown, mottled, very friable gravelly loamy sand

Composition

Wabeno soil and similar inclusions: 45 to 55 percent
Goodwit soil and similar inclusions: 35 to 45 percent
Contrasting inclusions: 5 to 20 percent

Inclusions

Contrasting inclusions:
- Fence soils, which are underlain by stratified lacustrine deposits
- The well drained Goodman soils
- The somewhat poorly drained Mudlake soils and the poorly drained Capitola soils in depressions
- The well drained Padus and Stambaugh soils and the somewhat excessively drained Pence soils, all of which are underlain by sandy or sandy and gravelly glacial outwash
- Areas of Goodwit and Wabeno soils that are nonstony or are bouldery
- Sloping areas of Goodwit and Wabeno soils

Similar inclusions:
- Areas of soils in which the upper layers are sandy loam, fine sandy loam, very fine sandy loam, or loam
- Soils that have a substratum of sandy loam or gravelly sandy loam
- Soils in which the silty deposits are as much as 60 inches thick

Soil Properties and Qualities

Drainage class: Moderately well drained
Seasonal high water table: Wabeno—perched, 1.5 to 3.0 feet below the surface; Goodwit—perched, 2.5 to 3.5 feet below the surface
Depth class: Wabeno—moderately deep to a fragipan; Goodwit—very deep
Permeability: Wabeno—moderate in the upper part, slow in the fragipan, and moderate in the substratum; Goodwit—moderate
Available water capacity: Wabeno—low; Goodwit—moderate or high
Organic matter content: Wabeno—very high in the organic layer and moderately low or moderate in the mineral surface layer; Goodwit—moderate in the surface layer
Percent of surface covered by stones: About 0.1 to 3.0

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other uses—cropland, pasture

Woodland

Suitability: Suited
Major management concerns: Wabeno—equipment limitation, windthrow hazard, plant competition; Goodwit—equipment limitation, plant competition
Management considerations:
- Ruts form easily on unsurfaced roads during wet periods. Log landings and haul roads can be stabilized with gravel.
- Windthrow on the Wabeno soil can be minimized by using harvest methods that do not leave the remaining trees widely spaced. The periodic salvaging of windthrown trees may be needed.

• Plant competition can be controlled by mechanical site preparation or by limited use of herbicides.

Cropland

Suitability: Well suited in areas where surface stones have been removed; poorly suited in other areas
Major management concerns: Water erosion, droughtiness, nutrient and pesticide loss, poor tilth, rock fragments
Management considerations:
• A conservation tillage system that leaves crop residue on the surface, contour stripcropping, and crop rotations that include close-growing crops help to control water erosion in the more sloping areas.
• Grassed waterways, diversions, and grade-stabilization structures help to prevent gully erosion and erosion from concentrated flow.
• Crop yields are somewhat limited during dry years in areas where the available water capacity of the soils is restricted. Irrigation can improve productivity.
• Crop residue management, additions of organic material, conservation tillage, and field windbreaks increase the water-holding capacity and conserve moisture. Reducing plant populations helps to ensure adequate moisture for all plants.
• Providing protection from water erosion, reducing chemical applications, and incorporating phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.
• Leaving crop residue on the surface or regularly adding other organic material helps to maintain fertility and good tilth and minimizes crusting.
• Some areas have stones on the surface. Unless they are removed, the stones interfere with tillage.

Pasture

Suitability: Moderately well suited
Major management concerns: Wabeno—droughtiness, rock fragments; Goodwit—rock fragments
Management considerations:
• Forage yields on the Wabeno soil are limited during most years by the restricted available water capacity. Drought-tolerant species are best suited to this soil.
• Restricting grazing during dry periods helps to maintain a high-quality cover of pasture plants.
• Surface stones may interfere with the use of machinery.

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Restricted permeability, wetness
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and state guidelines.

Dwellings without basements

Suitability: Wabeno—moderately well suited; Goodwit—well suited
Major management concerns: Wabeno—wetness, water erosion; Goodwit—water erosion
Management considerations:
• Onsite investigation is needed.
• Installing a subsurface drainage system and adding fill material to raise the elevation of the site help to overcome the wetness in areas of the Wabeno soil.
• Seeding and mulching exposed areas can help to control water erosion during and after construction.

Dwellings with basements

Suitability: Wabeno—poorly suited; Goodwit—moderately well suited
Major management concerns: Wetness, water erosion, cutbanks caving
Management considerations:
• Onsite investigation is needed.
• Installing a subsurface drainage system and adding fill material to raise the elevation of the site help to overcome the wetness.
• Seeding and mulching exposed areas can help to control water erosion during and after construction.
• In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: IVs in very stony areas; IIe in nonstony areas
Woodland ordination symbol: 3L (sugar maple)
Primary forest habitat type: AViO
Secondary forest habitat types: ATD or ATM

WdB—Wabeno-Mudlake silt loams, 1 to 15 percent slopes, very stony

Setting

Landform: Drumlins and moraines
Landscape position: Wabeno—side slopes and linear and slightly convex summits; Mudlake—depressions, drainageways, toeslopes, and footslopes
Slope range: Wabeno—1 to 15 percent; Mudlake—1 to 6 percent

Shape of areas: Long and narrow
Size of areas: 5 to 100 acres

Representative Profile

Wabeno

Organic layer:
0 to 1 inch—black, very friable muck

Mineral surface layer:
1 to 4 inches—brown, very friable silt loam

Subsoil:
4 to 21 inches—dark brown and brown, friable silt loam
21 to 28 inches—brown, mottled, friable sandy loam
28 to 31 inches—brown, mottled, firm sandy loam
31 to 42 inches—brown, mottled, friable gravelly loamy sand

Substratum:
42 to 60 inches—brown, mottled, friable gravelly loamy sand

Mudlake

Surface layer:
0 to 2 inches—black, very friable silt loam

Subsurface layer:
2 to 3 inches—brown, very friable silt loam

Subsoil:
3 to 30 inches—brown and strong brown, mottled, friable silt loam
30 to 39 inches—brown, mottled, friable sandy loam
39 to 49 inches—brown, mottled, friable loamy sand

Substratum:
49 to 60 inches—brown, mottled, friable loamy sand

Composition

Wabeno soil and similar inclusions: 55 to 65 percent
Mudlake soil and similar inclusions: 25 to 35 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The poorly drained Capitola soils in the lower depressions and drainageways
• Gastrow soils, which are underlain by stratified lacustrine deposits
• The well drained Goodman and Soperton soils
• The well drained Padus and Stambaugh soils and the somewhat excessively drained Pence soils, all of which are underlain by sandy or sandy and gravelly glacial outwash
• Areas of Mudlake and Wabeno soils that are nonstony or are bouldery
• Moderately steep areas of Wabeno soils

Similar inclusions:
• Areas of soils in which the upper layers are loam, very fine sandy loam, fine sandy loam, or sandy loam
• Soils that have a substratum of sandy loam or gravelly sandy loam
• Soils that have an apparent seasonal high water table
• Soils in which the silty deposits are as much as 60 inches thick

Soil Properties and Qualities

Drainage class: Wabeno—moderately well drained; Mudlake—somewhat poorly drained
Seasonal high water table: Wabeno—perched, 1.5 to 3.0 feet below the surface; Mudlake—perched, 0.5 foot to 2.0 feet below the surface
Depth class: Wabeno—moderately deep to a fragipan; Mudlake—very deep
Permeability: Wabeno—moderate in the upper part, slow in the fragipan, and moderate in the substratum; Mudlake—moderate in the upper part and moderate or moderately rapid in the lower part
Available water capacity: Wabeno—low; Mudlake—moderate or high
Organic matter content: Wabeno—very high in the organic layer and moderately low or moderate in the mineral surface layer; Mudlake—moderate in the surface layer
Percent of surface covered by stones: About 0.1 to 3.0

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other uses—cropland, pasture

Woodland

Suitability: Suited
Major management concerns: Wabeno—equipment limitation, windthrow hazard, plant competition; Mudlake—equipment limitation, windthrow hazard, plant competition, seedling mortality
Management considerations:
• In areas of the Mudlake soil, wetness and low soil strength frequently limit access by machinery to the dry summer months or to periods when the soil is frozen or snow cover is thick.
• In areas of the Wabeno soil that have slopes of more than about 6 percent, the selection of log landing sites

is limited. Landings can be established in the nearly level or gently sloping areas.
• Ruts form easily on unsurfaced roads during wet periods. Log landings and haul roads can be stabilized with gravel.
• Windthrow can be minimized by using harvest methods that do not leave the remaining trees widely spaced. The periodic salvaging of windthrown trees may be needed.
• Plant competition can be controlled by mechanical site preparation or by limited use of herbicides.
• Seedling mortality on the Mudlake soil can be minimized by planting vigorous nursery stock on the crest of cradle-knolls or on prepared ridges.

Cropland

Suitability: Moderately well suited in areas where surface stones have been removed; poorly suited in other areas
Major management concerns: Wabeno—water erosion, droughtiness, nutrient and pesticide loss, poor tilth, rock fragments; Mudlake—water erosion, droughtiness, nutrient and pesticide loss, wetness, poor tilth, rock fragments, low strength
Management considerations:
• A conservation tillage system that leaves crop residue on the surface, contour stripcropping, and crop rotations that include close-growing crops help to control water erosion in the more sloping areas.
• Grassed waterways, diversions, and grade-stabilization structures help to prevent gully erosion and erosion from concentrated flow.
• Crop yields are somewhat limited during dry years if the water table is lowered in areas of the Mudlake soil that have a restricted available water capacity.
• Crop yields on the Wabeno soil are limited during most years by the restricted available water capacity. Irrigation can improve productivity.
• Crop residue management, additions of organic material, conservation tillage, and field windbreaks increase the water-holding capacity and conserve moisture. Reducing plant populations helps to ensure adequate moisture for all plants.
• Providing protection from water erosion, reducing chemical applications, and incorporating phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.
• In areas of the Mudlake soil, the seasonal high water table may delay spring planting in wet years. Providing adequate drainage can improve crop production.
• Open ditches and tile drains remove excess surface water and improve internal drainage in areas of the Mudlake soil.
• Loose sand enters the tile lines unless a suitable filter covers the tile.
• Grading ditchbanks and protecting them with a plant cover help to prevent caving and erosion caused by flowing water.
• Leaving crop residue on the surface, adding other organic material to the soil, minimizing tillage, tilling and harvesting at the proper soil moisture content, and including grasses and legumes in the cropping sequence help to prevent excessive compaction, minimize crusting, and maintain good tilth.
• Some areas have stones on the surface. Unless they are removed, the stones interfere with tillage.
• Low soil strength limits the use of farm equipment to periods when the Mudlake soil is not wet.

Pasture

Suitability: Moderately well suited
Major management concerns: Wabeno—water erosion, droughtiness, nutrient and pesticide loss, rock fragments; Mudlake—rock fragments, low strength
Management considerations:
• Establishing a high-quality cover of grasses and legumes can reduce the hazard of water erosion in the more sloping areas of the Wabeno soil.
• Overgrazing depletes the plant cover, increases the hazard of water erosion, and increases the extent of undesirable plant species.
• Forage yields on the Wabeno soil are limited during most years by the restricted available water capacity. Drought-tolerant species are best suited to this soil.
• Restricting grazing during dry periods helps to maintain a high-quality cover of pasture plants.
• In the more sloping areas of the Wabeno soil, reducing chemical applications and applying phosphorus fertilizer at recommended rates help to protect the quality of surface water by reducing runoff losses to lakes and streams.
• Surface stones may interfere with the use of machinery.
• Low strength restricts the use of machinery in areas of the Mudlake soil.

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Wabeno—restricted permeability, wetness, slope; Mudlake—restricted permeability, wetness
Management considerations:
• Onsite investigation is needed. The design of

absorption fields should meet local and state guidelines.

Dwellings without basements

Suitability: Wabeno—moderately well suited; Mudlake—poorly suited
Major management concerns: Wabeno—wetness, slope, water erosion, cutbanks caving; Mudlake—wetness, water erosion
Management considerations:
• Onsite investigation is needed.
• Installing a subsurface drainage system and adding fill material to raise the elevation of the site help to overcome the wetness.
• In the more sloping areas of the Wabeno soil, buildings can be designed so that they conform to the natural slope of the land. The slope can be modified by cutting and filling.
• Seeding and mulching exposed areas can help to control water erosion during and after construction.
• In the more sloping excavated or cut and fill areas of the Wabeno soil, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Dwellings with basements

Suitability: Poorly suited
Major management concerns: Wabeno—wetness, slope, water erosion, cutbanks caving; Mudlake—wetness, water erosion, cutbanks caving
Management considerations:
• Onsite investigation is needed.
• Installing a subsurface drainage system and adding fill material to raise the elevation of the site help to overcome the wetness.
• In the more sloping areas of the Wabeno soil, buildings can be designed so that they conform to the natural slope of the land. The slope can be modified by cutting and filling.
• Seeding and mulching exposed areas can help to control water erosion during and after construction.
• In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: VIs in very stony areas; IIIe in nonstony areas
Woodland ordination symbol: Wabeno—3L (sugar maple); Mudlake—3W (red maple)
Primary forest habitat type: AViO
Secondary forest habitat types: ATD or ATM

WhA—Whisklake silt loam, 0 to 3 percent slopes

Setting

Landform: Outwash plains and stream terraces
Landscape position: Linear areas, depressions, and drainageways
Shape of areas: Irregular
Size of areas: 5 to 70 acres

Representative Profile

Surface layer:
0 to 3 inches—dark brown, friable silt loam

Subsurface layer:
3 to 6 inches—brown, very friable silt loam

Subsoil:
6 to 17 inches—brown, mottled, friable and very friable silt loam
17 to 30 inches—yellowish brown and pale brown, mottled, friable silt loam
30 to 36 inches—yellowish brown, mottled, friable loam

Substratum:
36 to 60 inches—yellowish brown, mottled, loose, stratified gravelly sand and very gravelly sand

Composition

Whisklake soil and similar inclusions: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The poorly drained Minocqua soils in the lower depressions and drainageways
• The well drained Stambaugh soils and the moderately well drained Vanzile soils in convex areas
• Areas that are subject to flooding
• Areas that have stones and boulders on the surface
• Soils in which the substratum has pockets of loamy sand, sandy loam, gravelly loamy sand, or gravelly sandy loam

Similar inclusions:
• Areas of soils in which the upper layers are very fine sandy loam, fine sandy loam, sandy loam, or loam
• Soils in which the substratum is at a depth of more than 40 inches
• Soils that have a substratum of sand, coarse sand, gravelly sand, gravelly coarse sand, very gravelly sand, or very gravelly coarse sand

Soil Properties and Qualities

Drainage class: Somewhat poorly drained
Seasonal high water table: Apparent, 0.5 foot to 2.0 feet below the surface
Depth class: Very deep
Permeability: Moderate in the solum and rapid or very rapid in the substratum
Available water capacity: Moderate
Organic matter content: Moderately low or moderate in the surface layer

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other uses—cropland, pasture

Woodland

Suitability: Suited
Major management concerns: Equipment limitation, windthrow hazard, plant competition, seedling mortality
Management considerations:
• Wetness and low soil strength frequently limit access by machinery to the dry summer months or to periods when the soil is frozen or snow cover is thick.
• Ruts form easily on unsurfaced roads during wet periods. Log landings and haul roads can be stabilized with gravel.
• Windthrow can be minimized by using harvest methods that do not leave the remaining trees widely spaced. The periodic salvaging of windthrown trees may be needed.
• Plant competition can be controlled by mechanical site preparation or by limited use of herbicides.
• Seedling mortality can be minimized by planting vigorous nursery stock on the crest of cradle-knolls or on prepared ridges.

Cropland

Suitability: Well suited
Major management concerns: Droughtiness, wetness, poor tilth, low strength
Management considerations:
• If the water table is lowered, crop yields are somewhat limited during dry years by the restricted available water capacity.
• Crop residue management, additions of organic material, conservation tillage, and field windbreaks increase the water-holding capacity and conserve moisture. Reducing plant populations helps to ensure adequate moisture for all plants.
• The seasonal high water table may delay spring planting in wet years. Providing adequate drainage can improve crop production.
• Open ditches and tile drains remove excess surface water and improve internal drainage.
• Loose sand enters the tile lines unless a suitable filter covers the tile.
• Grading ditchbanks and protecting them with a plant cover help to prevent caving and erosion caused by flowing water.
• Leaving crop residue on the surface, adding other organic material to the soil, minimizing tillage, tilling and harvesting at the proper soil moisture content, and including grasses and legumes in the cropping sequence help to prevent excessive compaction, minimize crusting, and maintain good tilth.
• Low soil strength limits the use of farm equipment to periods when the soil is not wet.

Pasture

Suitability: Well suited
Major management concerns: Low strength
Management considerations:
• Low strength restricts the use of machinery.

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Poor filtering capacity, restricted permeability, wetness
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and state guidelines.

Dwellings

Suitability: Poorly suited
Major management concerns: Dwellings without basements—wetness; dwellings with basements—wetness, cutbanks caving
Management considerations:
• Onsite investigation is needed.
• Installing a subsurface drainage system and adding fill material to raise the elevation of the site help to overcome the wetness.
• In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: IIw
Woodland ordination symbol: 2W (red maple)
Primary forest habitat type: TMC
Secondary forest habitat type: AViO or ATD

WrA—Worcester sandy loam, 0 to 3 percent slopes

Setting

Landform: Outwash plains and stream terraces
Landscape position: Linear areas, depressions, and drainageways
Shape of areas: Irregular
Size of areas: 5 to 70 acres

Representative Profile

Surface layer:
0 to 2 inches—black, very friable sandy loam

Subsurface layer:
2 to 4 inches—brown, mottled, friable sandy loam

Subsoil:
4 to 34 inches—dark brown and brown, mottled, friable sandy loam
34 to 39 inches—brown, mottled, very friable loamy sand

Substratum:
39 to 60 inches—dark yellowish brown, mottled, loose, stratified sand and gravelly sand

Composition

Worcester soil and similar inclusions: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The poorly drained Minocqua soils in the lower depressions and drainageways
• The well drained Padus soils and the moderately well drained Tipler soils in convex areas
• Wormet soils, which have thinner loamy deposits than those of the Worcester soil
• Areas that are subject to flooding
• Areas that have stones and boulders on the surface
• Soils in which the substratum has pockets of loamy sand, sandy loam, gravelly loamy sand, or gravelly sandy loam

Similar inclusions:
• Areas of soils in which the upper layers are loamy sand, loamy fine sand, fine sandy loam, very fine sandy loam, loam, or silt loam
• Soils in which the substratum is at a depth of more than 40 inches
• Soils that have a substratum of sand, coarse sand, gravelly sand, gravelly coarse sand, very gravelly sand, or very gravelly coarse sand

Soil Properties and Qualities

Drainage class: Somewhat poorly drained
Seasonal high water table: Apparent, 0.5 foot to 2.0 feet below the surface
Depth class: Very deep
Permeability: Moderate in the upper part and rapid or very rapid in the lower part
Available water capacity: Low or moderate
Organic matter content: Moderately low or moderate in the surface layer

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other uses—cropland, pasture

Woodland

Suitability: Suited
Major management concerns: Equipment limitation, windthrow hazard, plant competition, seedling mortality
Management considerations:
• Wetness and low soil strength frequently limit access by machinery to the dry summer months or to periods when the soil is frozen or snow cover is thick.
• Ruts form easily on unsurfaced roads during wet periods. Log landings and haul roads can be stabilized with gravel.
• Windthrow can be minimized by using harvest methods that do not leave the remaining trees widely spaced. The periodic salvaging of windthrown trees may be needed.
• Plant competition can be controlled by mechanical site preparation or by limited use of herbicides.
• Seedling mortality can be minimized by planting vigorous nursery stock on the crest of cradle-knolls or on prepared ridges.

Cropland

Suitability: Well suited
Major management concerns: Soil blowing, droughtiness, wetness, low strength
Management considerations:
• Field windbreaks, wind stripcropping, a cover of crop residue, and a winter cover crop reduce the hazard of soil blowing and help to prevent the damage to plants caused by windblown sand.
• If the water table is lowered, crop yields are limited during most years by the restricted available water capacity. Irrigation can improve productivity.
• Crop residue management, additions of organic material, conservation tillage, and field windbreaks increase the water-holding capacity and conserve

moisture. Reducing plant populations helps to ensure adequate moisture for all plants.
• The seasonal high water table may delay spring planting in wet years. Providing adequate drainage can improve crop production.
• Open ditches and tile drains remove excess surface water and improve internal drainage.
• Loose sand enters the tile lines unless a suitable filter covers the tile.
• Grading ditchbanks and protecting them with a plant cover help to prevent caving and erosion caused by flowing water.
• Low soil strength limits the use of farm equipment to periods when the soil is not wet.

Pasture

Suitability: Well suited
Major management concerns: Soil blowing, low strength
Management considerations:
• Establishing a high-quality cover of grasses and legumes can reduce the hazard of soil blowing.
• Overgrazing depletes the plant cover, increases the hazard of soil blowing, and increases the extent of undesirable plant species.
• Low strength restricts the use of machinery.

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Poor filtering capacity, wetness
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and state guidelines.

Dwellings

Suitability: Poorly suited
Major management concerns: Without basements—wetness, soil blowing; dwellings with basements—wetness, soil blowing, cutbanks caving
Management considerations:
• Onsite investigation is needed.
• Installing a subsurface drainage system and adding fill material to raise the elevation of the site help to overcome the wetness.
• Seeding and mulching exposed areas can help to control soil blowing during and after construction.
• In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: IIw
Woodland ordination symbol: 2W (red maple)
Primary forest habitat type: TMC

WtA—Wormet sandy loam, 0 to 3 percent slopes

Setting

Landform: Outwash plains and stream terraces
Landscape position: Linear areas, depressions, and drainageways
Shape of areas: Irregular
Size of areas: 5 to 65 acres

Representative Profile

Organic layer:
0 to 1 inch—black, very friable mucky peat

Mineral surface layer:
1 to 5 inches—brown, very friable sandy loam

Subsoil:
5 to 9 inches—dark brown, very friable sandy loam
9 to 18 inches—brown, mottled, very friable sandy loam

Substratum:
18 to 38 inches—strong brown, mottled, loose gravelly sand
38 to 61 inches—brown, mottled, loose sand

Composition

Wormet soil and similar inclusions: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The moderately well drained Manitowish soils and the somewhat excessively drained Pence soils in convex areas
• Poorly drained soils in the lower depressions and drainageways
• Areas that are subject to flooding
• Areas that have stones and boulders on the surface
• Soils in which the substratum has pockets of loamy sand, sandy loam, gravelly loamy sand, or gravelly sandy loam

Similar inclusions:
• Areas of soils in which the upper layers are loamy sand, loamy fine sand, very fine sandy loam, fine sandy loam, loam, or silt loam
• Soils in which the substratum is at a depth of more than 20 inches
• Soils that have a substratum of stratified sand, coarse sand, gravelly sand, or gravelly coarse sand

Soil Properties and Qualities

Drainage class: Somewhat poorly drained
Seasonal high water table: Apparent, 0.5 foot to 2.0 feet below the surface
Depth class: Very deep
Permeability: Moderate or moderately rapid in the upper part and rapid or very rapid in the lower part
Available water capacity: Low
Organic matter content: Very high in the organic layer and moderate or high in the mineral surface layer

Use and Management

Land uses: Dominant uses—woodland, wildlife habitat; other uses—cropland, pasture

Woodland

Suitability: Suited
Major management concerns: Equipment limitation, windthrow hazard, plant competition, seedling mortality
Management considerations:
• Wetness and low soil strength frequently limit access by machinery to the dry summer months or to periods when the soil is frozen or snow cover is thick.
• Ruts form easily on unsurfaced roads during wet periods. Log landings and haul roads can be stabilized with gravel.
• Windthrow can be minimized by using harvest methods that do not leave the remaining trees widely spaced. The periodic salvaging of windthrown trees may be needed.
• Plant competition can be controlled by mechanical site preparation or by limited use of herbicides.
• Seedling mortality can be minimized by planting vigorous nursery stock on the crest of cradle-knolls or on prepared ridges.

Cropland

Suitability: Well suited
Major management concerns: Soil blowing, droughtiness, nutrient and pesticide loss, wetness
Management considerations:
• Field windbreaks, wind stripcropping, a cover of crop residue, and a winter cover crop reduce the hazard of soil blowing and help to prevent the damage to plants caused by windblown sand.
• If the water table is lowered, crop yields are limited during most years by the restricted available water capacity. Irrigation can improve productivity.
• Crop residue management, additions of organic material, conservation tillage, and field windbreaks increase the water-holding capacity and conserve moisture. Reducing plant populations helps to ensure adequate moisture for all plants.
• Reducing chemical applications and providing split applications of nitrogen fertilizer at recommended rates during the growing season can reduce leaching losses and protect the quality of ground water.
• The proper scheduling of irrigation can minimize the leaching of plant nutrients and other chemicals out of the root zone and into the underlying ground water.
• The seasonal high water table may delay spring planting in wet years. Providing adequate drainage can improve crop production.
• Open ditches and tile drains remove excess surface water and improve internal drainage.
• Loose sand enters the tile lines unless a suitable filter covers the tile.
• Grading ditchbanks and protecting them with a plant cover help to prevent caving and erosion caused by flowing water.

Pasture

Suitability: Well suited
Major management concerns: Soil blowing, nutrient and pesticide loss
Management considerations:
• Establishing a high-quality cover of grasses and legumes can reduce the hazard of soil blowing.
• Overgrazing depletes the plant cover, increases the hazard of soil blowing, and increases the extent of undesirable plant species.
• Reducing chemical applications and applying nitrogen fertilizer at recommended rates can reduce leaching losses and protect the quality of ground water.

Septic tank absorption fields

Severity of soil limitations: Severe
Major restrictive features: Poor filtering capacity, wetness
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and state guidelines.

Dwellings

Suitability: Poorly suited
Major management concerns: Dwellings without basements—wetness, soil blowing; dwellings with basements—wetness, soil blowing, cutbanks caving
Management considerations:
• Onsite investigation is needed.

- Installing a subsurface drainage system and adding fill material to raise the elevation of the site help to overcome the wetness.
- Seeding and mulching exposed areas can help to control soil blowing during and after construction.
- In excavated or cut and fill areas, stabilizing or sloping the cutbanks can minimize the safety hazard and prevent the damage caused by caving.

Interpretive Groups

Land capability classification: IIw
Woodland ordination symbol: 2W (red maple)
Primary forest habitat type: TMC

Use and Management of the Soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help to prevent soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavioral characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils as woodland; for crops and pasture; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreational facilities; and for wildlife habitat. It can be used to identify the suitability and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

Woodland Management and Productivity

Forest resources have long been of major importance in Forest County. In the late 1800's, virtually all of the county was forested (Curtis, 1959). The original forests consisted of hardwoods, hemlock, balsam fir, and pine. They have been altered, however, by logging, fires, and agricultural and nonagricultural activities. Most of the original timber crop of hardwoods and conifers had been harvested by the early part of the 20th century. Fires were a common occurrence in the county until the advent of modern forest fire suppression methods. In 1952, nonforest land accounted for 58,000 acres, or about 9 percent of the land area. Of that total, more than 48,000 acres had been converted from woodland to farm, recreational, industrial, residential, and right-of-way uses (Wisconsin Conservation Department, 1955). This trend continued, and in 1968, 15 percent of the land area was nonforest land (Wisconsin Department of Natural Resources, 1968).

In 1983, about 544,000 acres in Forest County, or about 84 percent of the survey area, was forested. Of this total, about 493,000 acres was commercial forest (Hansen, 1984). About 77 percent of the commercial forested acreage is owned by the forest industry or is publically owned. The rest is owned by farmers and other private individuals and corporations.

The upland soils support a variety of tree species, primarily because of differences in the fertility and available water capacity of the soils. The timber stands are mostly sugar maple, American basswood, white ash, and yellow birch in areas of silty upland soils, where fertility levels are highest. Fence, Goodman, Goodwit, Soperton, Stambaugh, and Wabeno soils are in these areas (fig. 10). The timber stands also include red maple, eastern hemlock, northern red oak, black cherry, and paper birch in areas of loamy upland soils, where fertility and available water capacity are generally lower than in the silty soils. Examples of these loamy soils include Argonne, Laona, Padus, Padwood, Sarona, Sarwet, and Tipler soils. On the somewhat poorly drained soils, red maple and sugar maple are commonly a large component of the timber stands. Aspen and balsam fir also are major components of stands in areas of the wetter soils. Stands of aspen, balsam fir, and paper birch are on steep, north-facing slopes and on other soils that are managed for these species. Young, even-aged stands are mostly aspen and birch.



Figure 10.—Mixed northern hardwoods in an area of Wabeno-Goodwit silt loams, 1 to 6 percent slopes, very stony.

The upland tree species in areas of the droughty, less fertile soils, such as Croswell, Rubicon, and Vilas soils, are mainly red maple, paper birch, northern red oak, aspen, balsam fir, eastern white pine, red pine, and jack pine. These species are tolerant of low moisture conditions. They are also in timber stands on the Manitowish and Pence soils, which have a low available water capacity (fig. 11).

The wooded swamps, supported by poorly drained and very poorly drained soils, are along the drainageways and in depressions and basins throughout the county. These areas commonly have

timber stands of balsam fir, black ash, black spruce, northern whitecedar, tamarack, red maple, and aspen. Many stands are mostly swamp conifers. Paper birch, yellow birch, and American elm are in some stands.

The composition of the commercial forest land by forest type in 1983 was 47 percent maple, birch, and other upland hardwoods; 24 percent aspen and birch; 22 percent spruce, fir, and other lowland conifers; 5 percent pine; and 2 percent red maple, ash, and other lowland hardwoods (Hansen, 1984).

The composition of the commercial forest land by stand-size class in 1983 was 53 percent poletimber, 30 percent sawtimber, and 17 percent seedlings and saplings. The poletimber, seedlings, and saplings were mostly maple. The sawtimber was mostly maple, hemlock, pine, and aspen.

Growing stock had a volume of 8,217,860 cords in 1983, which represented an increase of about 45 percent since 1968. In 1982, the annual growth was 235,620 cords and the annual removal was 202,114 cords. In that year the growth of growing stock exceeded removal for all tree species, except for balsam fir, oak, yellow birch, elm, bigtooth aspen, and quaking aspen. In 1983, maple had the highest volume, followed by aspen, American basswood, birch, balsam fir, spruce, northern whitecedar, hemlock, pine, ash, and other species.

Sawtimber had a volume of 1,507,044,000 board feet in 1983, which represented an increase of 90 percent since 1968. In 1982, the annual growth was 62,690,000 board feet and the annual removal was 41,667,000 board feet. In that year the growth of



Figure 11.—Thinning is an essential management practice affecting the production of red pine. Pictured is an area of Pence sandy loam, 0 to 6 percent slopes.

sawtimber exceeded removal for all tree species, except for oak, yellow birch, elm, and aspen. In 1983, maple sawtimber had the highest volume, followed by hemlock, pine, aspen, American basswood, balsam fir, birch, northern whitecedar, spruce, ash, and other species.

Forest fires are controlled by a well organized suppression system. The main management need is probably the removal of defective trees and the less valuable species. The need for improved forest management is greatest on privately owned land other than industrial forest holdings.

Management for the wood crop on the soils in Forest County varies, but it should be governed by the species in the stand, the suitability of the soils for the species, and the objectives of the landowner. The best management alternatives are those that favor the hardwood species through a selection harvest or that favor aspen and birch through an even-aged approach (fig. 12). Even-aged management that favors pine, northern red oak, or sugar maple is desirable if the stand includes significant amounts of these species. Clear-cut areas commonly regenerate to mostly tag alder on very poorly drained soils. Management on the



Figure 12.—Selection thinning of a hardwood stand in an area of Wabeno-Goodwit silt loams, 1 to 6 percent slopes, very stony.

wetter soils can favor northern whitecedar for posts and piles or balsam fir for pulpwood.

Management should include controlling water erosion, overcoming soil-related equipment limitations, improving seedling survival, minimizing windthrow on the wetter sites, controlling vegetation that competes with natural or artificial regeneration, planting trees where natural regeneration is unreliable, harvesting in a timely manner, controlling damage by insects and diseases, removing cull trees and undesirable species, maintaining the most productive basal area, preventing woodland fires, and excluding livestock from the woodland.

Water erosion can occur as a result of site preparation and following cutting operations where the soil is exposed along logging roads and skid trails and on landings. Burned or overgrazed areas also are subject to erosion. Erosion generally is a hazard on forest land if the slope is 15 percent or more. Erosion is a problem in the steeper areas of some soils, such as Goodman, Laona, Metonga, Padus, Pence, Sarona, Soperton, Stambaugh, and Vilas soils. Excessive soil loss can be prevented by using proper logging techniques, planting trees, and establishing roads and trails on the contour; yarding uphill with a cable; removing water with water bars, out-sloping road surfaces, and culverts; preventing fires; and excluding livestock from the woodland. Drop structures may be needed to stabilize highly erodible areas. Seeding areas exposed by logging activities helps to establish a protective cover of vegetation.

Soil strength can limit the use of equipment on upland soils during the spring thaw and other excessively wet periods. Upland soils, such as Argonne, Fence, Goodman, Goodwit, Laona, Metonga, Padus, Padwood, Sarona, Sarwet, Soperton, Stambaugh, Tipler, and Wabeno soils, have low strength during wet periods. Ruts can form if wheeled vehicles are used when these soils are wet. Deep ruts tend to restrict lateral drainage and result in damage to tree roots. Wheeled vehicles should be used only when the soil is dry or has a thick snow cover. Stabilizing landings and roads with gravel can help to prevent damage caused by the repeated use of heavy equipment.

Soil wetness is the result of a high water table, flooding, or ponding. It causes seeding mortality, limits the use of equipment, results in the invasion or growth of undesirable plants following harvest, and increases the likelihood of windthrow by restricting the rooting depth of some tree species.

Seedling mortality is high on poorly drained soils, such as Capitola, Kinross, and Minocqua soils. It is also a problem on somewhat poorly drained soils, such as Au Gres soils, and in areas of soils where water ponds in the swales between cradle-knolls. The seedling survival rate can be improved by planting vigorous nursery stock on prepared ridges or on the crest of cradle-knolls. In areas where mechanical tree planters cannot be used because of wetness during the tree planting season, hand planting of trees is necessary if natural regeneration is unreliable.

The use of wheeled vehicles in areas of somewhat poorly drained, poorly drained, and very poorly drained soils is frequently limited to the dry summer months or to periods when the ground is frozen or snow cover is thick. In these areas, a gravel base for roads and landings can improve the ability of the soils to withstand the repeated use of heavy equipment. Landings can also be established on suitable adjacent soils that are better drained. Providing adequate culverts for graveled roads helps to maintain the natural drainage system.

Trees are shallow rooted where the water table is near the surface, and they can be blown down during periods of strong winds. Using a harvest method that does not leave the remaining trees widely spaced, such as a shelter-wood cut, can minimize the windthrow of trees. This method of harvesting also helps to ensure the natural regeneration of trees by controlling the extent of competing vegetation.

Plant competition is a problem on most of the woodland in the county because soil productivity is so high that undesirable plants grow when a harvest creates openings in the tree canopy. Competition from unwanted plants can delay or prevent natural regeneration of the desired tree species and hinder the establishment of planted trees. Plant competition is more severe on the wetter soils than on other soils. It can be controlled by using a method of selective cutting that maintains most of the tree canopy, by establishing the new forest soon after harvesting, or by removing the undesirable plants with herbicides. In areas where equipment can be used, the unwanted plants can be removed by machinery. Skidding may expose enough soil for adequate regeneration. Before trees are planted, site preparation by mechanical or chemical means generally is needed to control competing vegetation. Subsequent control of invading species may be needed on the more fertile soils, especially the wetter ones.

Slope and *rock outcrop* can limit the use of forestry equipment. Slope is a problem in areas where it is 15 percent or more. Bedrock outcrops also interfere with the use of equipment. Rock outcrop is common in areas of Metonga soils (fig. 13). Trees should be planted by hand and yarded with a cable in areas where the slope or rock outcrop prohibits the use of



Figure 13.—Rock outcrop can restrict the use of logging equipment. Pictured is an area of Metonga-Rock outcrop complex, 4 to 60 percent slopes, very stony.

equipment. Logging roads can be built on the contour. Roads and landings can be established in the less sloping areas.

Soil droughtiness can cause seedling mortality. The steeper slopes facing south or west are especially droughty because of high soil temperatures and evaporation rates. Seedling mortality can be minimized by using harvest methods that leave some mature trees to provide shade and protection and by planting vigorous nursery stock in the early spring when the soil is moist. Reinforcement planting may be needed on very dry sites.

Tables 5 and 6 can be used by woodland owners or forest managers in planning the use of soils for wood crops. Only those soils suitable for wood crops are listed. Table 5 lists the ordination symbol for each soil. Soils assigned the same ordination symbol require the same general management and have about the same potential productivity.

The first part of the *ordination symbol*, a number, indicates the potential productivity of the soils for an indicator tree species. The number indicates the volume, in cubic meters per hectare per year, which the indicator species can produce in a pure stand under natural conditions. The number 1 indicates low potential productivity; 2 or 3, moderate; 4 or 5, moderately high; 6 to 8, high; 9 to 11, very high; and 12 to 39, extremely high. The second part of the

symbol, a letter, indicates the major kind of soil limitation. The letter *R* indicates steep slopes; *X*, stoniness or rockiness; *W*, excess water in or on the soil; *T*, toxic substances in the soil; *D*, restricted rooting depth; *C*, clay in the upper part of the soil; *S*, sandy texture; *F*, a high content of rock fragments in the soil; and *L*, low strength. The letter *A* indicates that limitations or restrictions are insignificant. If a soil has more than one limitation, the priority is as follows: R, X, W, T, D, C, S, F, and L.

In table 5, *slight, moderate,* and *severe* indicate the degree of the major soil limitations to be considered in management.

Erosion hazard is the probability that damage will occur as a result of site preparation and cutting where the soil is exposed along roads, skid trails, and fire lanes and in log-handling areas. Forests that have been burned or overgrazed also are subject to erosion. Ratings of the erosion hazard are based on the percent of the slope and on the content of rock fragments in the surface layer. A rating of *slight* indicates that no particular prevention measures are needed under ordinary conditions. A rating of *moderate* indicates that erosion-control measures are needed in certain silvicultural activities. A rating of *severe* indicates that special precautions are needed to control erosion in most silvicultural activities.

Seedling mortality refers to the death of naturally occurring or planted tree seedlings, as influenced by the kinds of soil, soil wetness, or topographic conditions. The factors used in rating the soils for seedling mortality are texture, depth to a seasonal high water table, rock fragments in the upper 20 inches of the soil, effective rooting depth, and slope aspect. A rating of *slight* indicates that seedling mortality is not likely to be a problem under normal conditions. Expected mortality is less than 25 percent. A rating of *moderate* indicates that some problems from seedling mortality can be expected. Extra precautions are advisable. Expected mortality is 25 to 50 percent. A rating of *severe* indicates that seedling mortality is a serious problem. Extra precautions are important. Replanting may be necessary. Expected mortality is more than 50 percent.

Windthrow hazard is the likelihood that trees will be uprooted by the wind because the soil is not deep enough for adequate root anchorage (fig. 14). The main restrictions that affect rooting are a seasonal high water table and the depth to bedrock, a fragipan, or other limiting layers. A rating of *slight* indicates that under normal conditions no trees are blown down by the wind. Strong winds may damage trees, but they do not uproot them. A rating of *moderate* indicates that some trees can be blown down during periods when the soil is wet and winds are moderate or strong. A rating of *severe* indicates that many trees can be blown down during these periods.

Plant competition ratings indicate the degree to which undesirable species are expected to invade and grow when openings are made in the tree canopy. The main factors that affect plant competition are depth to the water table and the available water capacity. A rating of *slight* indicates that competition from undesirable plants is not likely to prevent natural regeneration or suppress the more desirable species. Planted seedlings can become established without undue competition. A rating of *moderate* indicates that competition may delay the establishment of desirable species. Competition may hamper stand development, but it will not prevent the eventual development of fully stocked stands. A rating of *severe* indicates that competition can be expected to prevent regeneration unless precautionary measures are applied.

The *potential productivity* of merchantable or *common trees* on a soil is expressed as a *site index* and as a *volume* number. The site index is the average height, in feet, that dominant and codominant trees of a given species attain in 50 years. The site index applies to fully stocked, even-aged, unmanaged stands. Commonly grown trees are those that woodland managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability.

The *volume*, a number, is the yield likely to be produced by the most important trees. This number, expressed as cubic feet per acre per year, indicates the amount of fiber produced in a fully stocked, even-aged, unmanaged stand.

The first species listed under *common trees* for a soil is the indicator species for that soil. It generally is the most common species on the soil and is the one that determines the ordination class.

Trees to plant are those that are suitable for commercial wood production. Additional information about these trees is available in the local office of the Natural Resources Conservation Service.

Table 6 gives information about operating forestry equipment in logging areas and along skid trails, on log landings, along haul roads, and in site preparation and planting, which includes row seeding. Limitations are given for the most limiting season. In Forest County the most limiting season generally is spring. The limitations can also apply, however, during other excessively wet periods, such as after a heavy rainfall. The preferred operating season is the period when the use of forestry equipment causes the least amount of soil damage. This period generally is when the soil is not too wet or when the ground is frozen.



Figure 14.—Cradle-knoll topography in an area of Argonne soils resulted from the windthrow of trees in earlier times.

In table 6, the equipment limitations reflect the characteristics and conditions of the soil that restrict use of the equipment generally needed in woodland harvesting and regeneration activities. The chief characteristics and conditions considered in the ratings are soil wetness, the hazard of flooding, rock outcrops, stones and boulders on the surface, texture of the surface layer, slope, depth to hard bedrock, traffic-supporting capacity (or soil strength), and the potential for frost action. Soils that have a moderate or high content of silt have low strength in the extended spring thaw period and during extended periods of high rainfall. Ruts can form easily in areas of these soils during these wet periods.

The ratings of *slight, moderate,* or *severe* in the table are based on the use of conventional equipment and procedures. Special procedures or types of equipment can sometimes be utilized to reduce or overcome the site limitations. If wetness is a limitation, for example, the use of high flotation equipment may prevent the formation of ruts. Restrictions on the use of equipment indicate the need for choosing the right equipment to be used and the need for accurate timing of operations to avoid seasonal limitations. The

cost of operations generally increases as the limitations become more severe. The ratings for log landings and haul roads can be used as a guide for establishing them in the least costly locations.

Logging areas and skid trails include areas where some or all of the trees are being cut. Generally, equipment traffic is least intensive in the logging areas. Skid trails, which generally are within the logging area, are roads or trails over which the logs are dragged or hauled from the stump to a log landing. A rating of *slight* indicates that the use of conventional equipment is not normally restricted by the physical site conditions. A rating of *moderate* indicates that the use of equipment or season of use is restricted because of one or more soil factors. A rating of *severe* indicates that special equipment or techniques are needed to overcome the limitations or that the time of efficient operation is very limited.

Log landings are areas where logs are assembled for transportation (fig. 15). Wheeled equipment may be used more frequently in these areas than in any other areas affected by logging. Considerable soil compaction can be expected in these areas. Good areas for landings require little or no surface preparation or cutting and filling. A rating of *slight* indicates that the soil is a good site for landings and the area can readily be returned to forest use. A rating of *moderate* indicates that the season of use is somewhat limited or that such practices as grading, cutting, filling, or drainage are usually required to make the site suitable for a landing and returning the site to forest use is difficult. A rating of *severe* indicates that the season of use is very limited or that special or expensive techniques are needed to overcome the limitations. There may also be significant risk of environmental damage, which makes returning the area to forest use very difficult or impossible.

Haul roads are access roads leading from log landings to primary or surfaced roads. The haul roads serve as transportation routes for wheeled logging equipment. Generally, they are unpaved roads and are not graveled. The wetter soils and the silty upland soils, which are slippery and easily rutted during wet periods, commonly provide poor locations for haul roads. A rating of *slight* indicates that no serious limitations affect the location, construction, and maintenance of haul roads or the season of use. A rating of *moderate* indicates some limitations, but the limitations can be overcome with routine construction techniques. A rating of *severe* indicates that it is difficult and expensive to establish and maintain haul roads on the soil or that the season of use may be severely restricted.

Site preparation and planting are the mechanized operations for establishing planted trees in an area. The ratings are based on limitations that affect the efficient use of equipment and the risk of damage to the site caused by the equipment. Operating techniques should not displace or remove topsoil from the site or create channels that concentrate storm runoff. A rating of *slight* indicates that no serious limitations affect site preparation and planting. A rating of *moderate* indicates that the site conditions prevent the efficient use of the equipment or that the site may be damaged by the equipment. A rating of *severe* indicates that special equipment or techniques, such as hand planting of trees, are needed to overcome the limitations.

Additional information about woodland management and productivity can be obtained from the Wisconsin Department of Natural Resources, the local office of the Natural Resources Conservation Service, or the Cooperative Extension Service.

Forest Habitat Types

John Kotar, senior research scientist, Department of Forestry, University of Wisconsin-Madison, helped prepare this section.

The forest habitat type system used in Forest County is derived from a field guide developed for northern Wisconsin (Kotar and others, 1988). The system of habitat classification is based on the concept that plants, including trees, normally occur in predictable patterns or communities and that these communities reflect differences in site characteristics, primarily the moisture content and fertility of the soils. A forest habitat type is an association of dominant tree and ground flora species in a climax plant community. It encompasses all soils capable of producing similar plant communities at climax, which is the stage in ecological development when the vegetative community becomes stable and perpetuates itself.

A habitat type can be identified during most stages of successional growth by examining the reproductive success of various tree species and by inspecting the ground flora, which becomes relatively stable soon after the establishment of a forest canopy. In a young forest, the patterns or associations of understory plants can be used to predict the dominant tree species in the climax forest.

The successional stages and trends also are predictable for the various habitat types. This predictability allows forest managers to make accurate prescriptions for manipulating vegetation based on the ecological potential of the soil rather than on the current forest cover type, which can vary depending



Figure 15.—A log landing in an area of Padus soils.

largely on how the forest has been disturbed. Additional management implications for each habitat type are in the "Field Guide to Forest Habitat Types of Northern Wisconsin" (Kotar and others, 1988).

Habitat types have been determined for most of the soils in Forest County. They are specified at the end of each map unit description in the section "Detailed Soil Map Units." Although soil map units do not coincide exactly with habitat types, there is a strong correlation between them. If more than one habitat type is associated with a detailed soil map unit, the habitat types are identified as primary and secondary. The primary habitat type is the one that is most common on the map unit. The secondary habitat type is less common. The assigned habitat types may be different in some small areas included in mapping. The following paragraphs provide brief descriptions of the habitat types in the county. The name of each habitat type is derived from the potential climax vegetation on a site. It represents a combination of tree species, which are listed first, and ground flora species. The descriptions provide information about the potential climax tree species and some of the common understory species.

QAE—Quercus-Acer/Epigaea (Red Oak-Red Maple/Trailing Arbutus) habitat type. The presumed climax overstory of this habitat type consists of northern red oak and red maple. Present stands are dominated by mixtures of red maple, jack pine, red pine, red oak, aspen, white spruce, and balsam fir.

The understory vegetation consists primarily of brackenfern, blueberries, and trailing arbutus and some wintergreen, reindeer moss, and bearberry. The low shrub layer is typically well developed, but tall shrubs are sparse.

This habitat type is most suitable for the management of jack pine. Red pine plantations are economically feasible when managed for short rotations with fiber production as the objective. Establishing aspen or red oak on this type is not recommended unless the goal is wildlife habitat.

AQV—Acer-Quercus/Vaccinium (Red Maple-Red Oak/Low Sweet Blueberry) habitat type. The presumed climax overstory of this habitat type is dominated by red maple and northern red oak and commonly includes some eastern white pine. Present stands are dominated almost entirely by early successional species, such as aspen, paper birch, jack pine, red pine, and eastern white pine.

The understory vegetation consists primarily of beaked hazelnut, brackenfern, blueberries, wild lily-of-the-valley, and large-leaved aster.

This habitat type is suitable for management of the native species, including pine, aspen, and paper birch. Of the hardwoods, only northern red oak and red maple are suitable for fiber production or wildlife habitat.

PMV—Pinus/Maianthemum-Vaccinium (White Pine/Wild Lily-of-the-Valley-Low Sweet Blueberry) habitat type. The presumed climax overstory of this habitat type is dominated by eastern white pine, but it may include balsam fir, white spruce, red maple, or northern red oak as a second canopy.

Present stands are largely dominated by mixtures of jack pine, red pine, eastern white pine, aspen, red maple, and northern red oak. The understory vegetation is similar to that of the AQV habitat type, but the herb layer generally is better developed.

This habitat type is considered optimal for management of red pine or eastern white pine. Yields are nearly as high as those of the more mesic habitat types, but the potential for competition from hardwood species is much lower. Except for northern red oak, hardwoods are suitable only for fiber production or for wildlife habitat. The potential for production of aspen is very high.

AQVib—Acer-Quercus/Viburnum (Sugar Maple-Red Oak/Mapleleaf Viburnum) habitat type. The presumed climax species of this habitat type is dominated by sugar maple. The succession to sugar maple on logged-over sites, however, is less rapid than on other habitat types where this species is capable of growing. Present successional stands on AQVib are most often dominated by mixtures of northern red oak and red maple. Mixtures of aspen, paper birch, and eastern white pine also are common. Productivity potential is very high for eastern white pine and red pine; high for northern red oak, red maple, white ash, and American basswood; and moderate to low for sugar maple.

Characteristic understory species are mapleleaf viburnum, witch hazel, and pointed-leaved tick trefoil. Other common species include beaked hazelnut, hog peanut, large-leaved aster, and brackenfern.

ATM—Acer-Tsuga/Maianthemum (Sugar Maple-Hemlock/Wild Lily-of-the-Valley) habitat type. The presumed climax overstory of this habitat type is dominated by sugar maple, eastern hemlock, and yellow birch. Successional stages, however, can be very diverse because many native tree species grow well in areas of this habitat type. Management options generally are determined by the condition of current stands rather than by site limitations.

The diversity of understory species is relatively low. The most common species are wild lily-of-the-valley, wild sarsaparilla, large-leaved aster, and beaked hazelnut.

TMC—Tsuga/Maianthemum-Coptis (Hemlock/Wild Lily-of-the-Valley-Goldthread) habitat type. The presumed climax overstory of this habitat type consists of eastern hemlock, yellow birch, red maple, and sugar maple.

This habitat type commonly occurs in low areas within many of the other habitat types and as a transitional type in areas between lake shores or swamps and upland areas. Conifers, such as balsam fir, northern whitecedar, and white spruce, also occur in areas of this habitat type. Characteristic understory species are wild lily-of-the-valley, goldthread, bunchberry, clubmoss, and yellow beadlily. Blueberries, brackenfern, and large-leaved aster are abundant in some areas.

Eastern hemlock and yellow birch have the highest potential for forestry products, and northern whitecedar, balsam fir, and white spruce are suitable as wildlife habitat or for fiber production. Although sugar maple reproduces in areas of this type, it grows poorly and exhibits poor form. Areas of this type that are in the better drained positions are well suited to management for eastern white pine.

ATD—Acer-Tsuga/Dryopteris (Sugar Maple-Hemlock/Spinulose Shield Fern) habitat type. The

presumed climax overstory of this habitat type is dominated by sugar maple, eastern hemlock, and yellow birch.

Although most hardwoods grow well on this habitat type once they are established, sugar maple tends to dominate both the young and mature stands. For this reason, management is difficult for intolerant and mid-tolerant species in areas of this habitat type.

The understory is typically poorly developed. A shrub layer is normally absent, and ground vegetation is sparse. The most conspicuous species are spinulose shield fern, lady fern, wild lily-of-the-valley, and sugar maple seedlings.

AViO—Acer/Viola-Osmorhiza (Sugar Maple/Yellow Violet-Sweet Cicely) habitat type. The presumed climax overstory of this habitat type is dominated by sugar maple. Early and mid-successional stages may have a mixture of several hardwood species, including American basswood, white ash, yellow birch, and northern red oak. With the exception of eastern hemlock, conifers generally are absent from this habitat type. The growth potential for all native hardwoods is very high.

The understory vegetation in areas of this type generally is well developed, and the diversity of species is high. The most characteristic species are sweet cicely, trillium, yellow violet, lady fern, spinulose shield fern, hairy Solomon's seal, false Solomon's seal, jack-in-the-pulpit, and blue cohosh.

Crops and Pasture

John W. Pingry, agronomist, Natural Resources Conservation Service, helped prepare this section.

General management needed for crops and pasture is suggested in this section. The estimated yields of the main crops and pasture plants are listed, the system of land capability classification used by the Natural Resources Conservation Service is explained, and prime farmland is described.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under the heading "Detailed Soil Map Units." Specific information can be obtained from the local office of the Natural Resources Conservation Service or the Cooperative Extension Service.

In 1990, about 30,000 acres in Forest County was farmland (Wisconsin Agricultural Statistics Service, 1991). Of this total, 5,200 acres was used for alfalfa hay, 2,800 acres for all other hay species, 1,000 acres for oats, 900 acres for corn for silage, 500 acres for corn for grain, and 300 acres for barley. The rest of the acreage was used for other crops, pasture, woodlots, or other farm uses.

The soils in Forest County have potential for increased production of crops. Food production could be increased by extending the latest crop production technology to all cropland in the county. This soil survey can greatly facilitate the application of such technology. Some acreage currently being used as woodland could be used for crop production. However, climatic conditions and market availability make this unlikely.

Management varies on the different kinds of soil in Forest County. Basic management, however, is needed on practically all of the soils. Basic management of cropland includes controlling water erosion, providing an adequate drainage system, maintaining fertility, maintaining or improving tilth, applying lime, preparing a good seedbed, and harvesting in a timely manner. Basic management of pasture includes pasture renovation, proper stocking rates, and clipping or mowing where feasible. Clipping and mowing remove weeds and brush and encourage uniform regrowth and grazing. Timely deferment of grazing is also needed to keep the pasture in good condition.

The paragraphs that follow describe the major management concerns in areas of cropland and pasture in the county.

Water erosion is generally a hazard in areas where the slope is more than about 2 percent. Much of the acreage in Forest County is susceptible to water erosion, but most of this acreage has a protective cover of vegetation (fig. 16). Erosion is a concern in areas where erodible soils are used for row crops.

Erosion is damaging for three main reasons. First, productivity is reduced as the surface layer is lost and the less fertile subsurface layer and part of the subsoil are incorporated into the plow layer. Loss of the organic-rich surface layer is especially damaging on soils that have a layer in or below the subsoil that limits the depth of the root zone. Wabeno soils, for example, have such a layer in the subsoil. Second, erosion adversely affects tilth and the infiltration of water. Eroded soils are generally more difficult to till than uneroded soils because the clay content of the plow layer generally increases when part of the subsoil is incorporated into the plow layer. Third, erosion results in the sedimentation of lakes and streams. Control of erosion helps to minimize this sedimentation and improves the quality of water for municipal use, for recreation, and for fish and wildlife.

Erosion-control practices should provide a protective cover, reduce the runoff rate, and increase the rate of water infiltration. A conservation cropping



Figure 16.—Hay in an area of Padus soils provides a protective cover and thus reduces the hazard of water erosion.

system that keeps a vegetative cover on the soil for extended periods can hold soil erosion to amounts that do not reduce the productive capacity of the soils (fig. 17). On livestock farms, which require pasture and hay, including legumes or legume and grass forage crops in the cropping system helps to control erosion and also provides nitrogen and improves tilth for other crops grown in rotation.

A conservation tillage system that leaves protective amounts of crop residue on the surface after planting, such as mulch tillage using a chisel or a disc, increases the rate of water infiltration, reduces the runoff rate, and helps to control water erosion. Conservation tillage systems that clear a narrow band of residue away from the seed help to overcome cool soil temperatures in the spring.

Contour stripcropping and contour farming also help to control runoff and erosion. These practices are best suited to soils that generally have uniform slopes, such as Goodman and Wabeno soils. Grassed waterways remove excess surface water and reduce the hazard of erosion along natural drainageways. Diversions direct runoff away from erodible areas. Terraces reduce the length of slopes and provide safe outlets for runoff.

Critical-area plantings, such as those along roadsides and in gravel pits, help to stabilize highly erodible soils where vegetation is difficult to establish.

Soil blowing is a hazard on many of the soils in Forest County, especially the sandy soils, such as Au Gres, Croswell, Rubicon, and Vilas soils. It can result in soil loss and can damage young crops in a few hours if winds are strong and the soils are dry and bare of vegetation or crop residue. Windbreaks help to prevent the damage to soils and crops caused by soil blowing. They also conserve soil moisture. Small grain



Figure 17.—Rotations of corn, small grain, and hay are effective in controlling erosion in an area of sloping Stambaugh soils.

crops can be planted as a cover, and green manure crops and a system of conservation tillage can be used to maintain surface cover, maintain the content of organic matter, and reduce the hazard of soil blowing.

Further information about the design of erosion-control practices for each kind of soil can be obtained at the local office of the Natural Resources Conservation Service.

Soil wetness is a major management concern on some of the acreage used for crops and pasture in the county. The poorly drained Fordum, Kinross, and Minocqua soils are naturally so wet that the production of crops commonly grown in the county is generally not possible unless the soils are drained. Unless drained, somewhat poorly drained soils, such as Gastrow and Worcester soils, are so wet that crops are damaged during most years.

If organic soils are drained and used as cropland, they oxidize, subside, and are subject to soil blowing when the pore space is filled with air. Special drainage systems are needed to control the depth and period of drainage. Keeping the water table at the level required by crops during the growing season and raising it to the surface during other times of the year can help to minimize oxidation and subsidence and reduce the hazard of soil blowing in areas of organic soils.

The design of both surface and subsurface drainage systems varies with the kind of soil and with particular site conditions. In some cases, artificial drainage is impossible or impractical because of a lack of suitable outlets.

Crops grown in most areas of poorly drained and very poorly drained soils are subject to frost damage because of the low position of these soils on the landscape. The number of frost-free days per season is lower in these areas than on adjacent uplands because of cold air drainage to the lowlands.

Further information about the design of drainage systems for each kind of soil can be obtained at the local office of the Natural Resources Conservation Service.

Soil fertility is naturally low or medium in most of the soils in the county. Fertility can be improved by applying nutrients and by choosing a cropping system that adds organic material to the soil. A diversified cropping system and applications of manure help to maintain the content of organic matter. If specialty crops, such as potatoes, are grown, green manure crops are needed to maintain the content of organic matter.

The addition of nutrients increases the yields of most crops. Most soils in the county are naturally acid and require applications of lime, which can raise the pH level sufficiently for good growth of alfalfa and other crops that grow best on nearly neutral soils. On all soils, additions of lime and nutrients should be based on the results of soil tests, on the needs of the crop, and on the expected level of yields. The University of Wisconsin Extension Service can help in determining the kind and amount of nutrients and lime to be applied.

Soil tilth is an important factor affecting the germination of seeds, the emergence of seedlings, and the infiltration of water into the soil. Soils that have good tilth are granular and porous. Tilling or grazing when the soil is too wet can cause poor tilth, especially if the surface layer is loam or silt loam. Intense rainfall on bare soil can cause the formation of a crust on the surface. The crust reduces the rate of water infiltration and increases the runoff rate and the hazard of erosion. Good soil tilth is more difficult to maintain on eroded soils than in areas that are not eroded because the eroded soils have a lower content of organic matter. Returning crop residue to the soil, growing green manure crops, and regularly adding manure or other organic material improve soil structure and tilth and minimize crusting.

Excessive tillage, use of heavy farm machinery, overgrazing, and tilling or grazing when the soil is too wet can result in surface compaction and, thus, in poor tilth. Excessive tillage can be avoided by using a system of conservation tillage. Proper stocking rates and rotation grazing can prevent overgrazing. Chisel plowing helps to loosen compacted soil.

Some soils in the survey area have stones on the surface. Examples are areas of Goodwit, Mudlake, and Wabeno soils. These areas cannot be tilled unless the stones are removed.

Irrigation is well suited to some of the nearly level and gently sloping soils that have a low or moderate available water capacity, such as Croswell, Manitowish, Padus, Pence, and Vilas soils. Irrigation helps to maintain a sufficient amount of available water for sustained crop yields. Because of the rapid and very rapid permeability in these soils, the irrigation rate should be limited. Limiting the irrigation rate can minimize the leaching of chemicals and nutrients, especially nitrogen, out of the root zone and into the ground water. The water for irrigation is generally drawn from wells or ponds. Strong winds can prevent uniform applications of water from sprinkler systems. Field windbreaks and vegetative row barriers help to deflect the force of the wind and conserve available water.

Further information about the design of irrigation systems for each kind of soil can be obtained at the local office of the Natural Resources Conservation Service.

Field crops commonly grown in the county include corn, oats, and barley. Most of the corn is used for silage. Small acreages of wheat and rye are grown in some years. Because of the beef and dairy herds in the county, hay is an important crop. Mixtures of bromegrass and alfalfa and mixtures of timothy and red clover are the dominant hay crops.

Pastures are vegetated with the same grass-legume mixtures used for hay. A good system of fertilization and a system of rotation grazing that includes adequate rest periods would improve most pastures substantially. Forage yields on droughty soils, such as Pence and Vilas soils, are generally somewhat limited. Planting early in spring, before the surface layer has a chance to dry, is most effective in areas of these soils. Restricted use during dry periods helps to keep the pasture in good condition. Overgrazing reduces the plant cover and thus can increase the hazard of erosion. It also affects soil tilth. Fertilization, renovation, and controlled grazing help to maintain the plant cover. In areas of the finer textured soils, restricting grazing during wet periods also helps to keep the pasture in good condition.

Specialty crops grown commercially in the county include small acreages of potatoes, sweet corn, tomatoes, asparagus, strawberries, raspberries, and pumpkins. The latest information about growing specialty crops can be obtained from the local offices of the Cooperative Extension Service and the Natural Resources Conservation Service.

Yields per Acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 7. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors. The land capability classification of map units in the survey area also is shown in the table.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations also are considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green manure crops; and harvesting that ensures the smallest possible loss.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 7 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Natural Resources Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils for those crops.

Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The criteria used in grouping the soils do not include major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor do they include possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for woodland or for engineering purposes.

In the capability system, soils are generally grouped at three levels—capability class, subclass, and unit (USDA, 1961). Only class and subclass are used in this survey.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, IIe. The letter *e* shows that the main hazard is the risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c,* used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w, s,* or *c* because the soils in class V are subject to little or no erosion. They have other limitations that restrict their use to pasture, woodland, wildlife habitat, or recreation.

The capability classification of map units in this survey area is given in the section “Detailed Soil Map Units” and in the yields table.

Prime Farmland

Prime farmland is one of several kinds of important farmland defined by the U.S. Department of Agriculture. It is of major importance in meeting the Nation’s short- and long-range needs for food and fiber. Because the supply of high-quality farmland is

limited, the U.S. Department of Agriculture recognizes that responsible levels of government, as well as individuals, should encourage and facilitate the wise use of our Nation's prime farmland.

Prime farmland, as defined by the U.S. Department of Agriculture, is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is available for these uses. It could be cultivated land, pastureland, forestland, or other land, but it is not urban or built-up land or water areas. The soil qualities, growing season, and moisture supply are those needed for the soil to economically produce sustained high yields of crops when proper management, including water management, and acceptable farming methods are applied. In general, prime farmland has an adequate and dependable supply of moisture from precipitation or irrigation, a favorable temperature and growing season, acceptable acidity or alkalinity, an acceptable salt and sodium content, and few or no rocks. It is permeable to water and air. It is not excessively erodible or saturated with water for long periods, and it either is not frequently flooded during the growing season or is protected from flooding. Slope ranges mainly from 0 to 6 percent. More detailed information about the criteria for prime farmland is available at the local office of the Natural Resources Conservation Service.

About 209,148 acres in Forest County, or about 32.3 percent of the total land area, is prime farmland. This land is in scattered areas throughout the county. Much of this land remains wooded, but some is used for crops, mainly corn, oats, hay, and barley.

A recent trend in land use in some parts of the survey area has been the loss of some prime farmland to industrial and urban uses. The loss of prime farmland to other uses puts pressure on marginal lands, which generally are more erodible, droughty, and less productive and cannot be easily cultivated.

The map units in the survey area that are considered prime farmland are listed in table 8. This list does not constitute a recommendation for a particular land use. On some soils included in the list, measures that overcome a hazard or limitation, such as flooding, wetness, and droughtiness, are needed. Onsite evaluation is needed to determine whether or not the hazard or limitation has been overcome by corrective measures. The extent of each listed map unit is shown in table 4. The location is shown on the detailed soil maps. The soil qualities that affect use and management are described under the heading "Detailed Soil Map Units."

Windbreaks and Environmental Plantings

There are few windbreaks in Forest County because the county is mostly wooded, and individual tracts of cropland are surrounded by naturally occurring woodland. Because most homesites also are surrounded by woodland, there is little need for windbreaks, shelterbelts, or environmental plantings.

Most windbreaks are used in areas of Padus, Pence, Stambaugh, and Vanzile soils. Norway spruce, white spruce, Colorado blue spruce, and red pine are the most commonly planted species. The plantings are mostly on the west or north sides of the protected areas or are on both sides. Multi-row plantings, ranging from two to six rows, are generally used.

Windbreaks protect livestock, buildings, yards, fruit trees, gardens, and cropland from wind and snow; help to keep snow on fields; and provide food and cover for wildlife. Field windbreaks are narrow plantings made at right angles to the prevailing wind and at specific intervals across the field. The interval depends on the erodibility of the soil.

Environmental plantings help to beautify and screen houses and other buildings and to abate noise. The plants, mostly evergreen shrubs and trees, are closely spaced. To ensure plant survival, a healthy planting stock of suitable species should be planted properly on a well prepared site and maintained in good condition.

Table 9 shows the height that locally grown trees and shrubs are expected to reach in 20 years on various soils. The estimates in table 9 are based on measurements and observation of established plantings that have been given adequate care. They can be used as a guide in planning windbreaks and screens. Additional information on planning windbreaks and screens and planting and caring for trees and shrubs can be obtained from the local office of the Natural Resources Conservation Service, the Wisconsin Department of Natural Resources, the Cooperative Extension Service, or commercial nurseries.

Recreation

Sheila Landsverk, instructor, University of Wisconsin-Extension, helped prepare this section.

The lakes, rivers, streams, and woodlands in Forest County have made the county a popular vacation area (fig. 18). Water-based recreation, such as fishing, boating, waterskiing, and swimming, are important.



Figure 18.—The abundant water resources have made Forest County a popular vacation area.

Forest County has 155 lakes more than 10 acres in size and 710 miles of streams, most of which are classified as trout waters. The headwaters of the Brule, Peshtigo, Pine, Popple, and Wolf Rivers provide challenging opportunities for the use of canoes, innertubes, and kayaks. The Headwaters Wilderness Area was established in Forest County in 1984. More than 20,000 acres at the headwaters of the Pine River was set aside as a Federal wilderness area.

The large wooded areas in Forest County attract many ruffed grouse hunters during the bird season and many deer and bear hunters during the archery and gun seasons. The abundance of wild rice and other aquatic foods makes the area a haven for waterfowl. The Nicolet National Forest and numerous state and county holdings provide areas for sightseeing, camping, hiking, and hunting.

In 1992, a 25-mile-long National Scenic Byway was established for automobiles. This route encompasses parts of Old Military Road and Butternut Road, just south of the Butternut-Franklin Lake area. It includes pull-off areas with interpretive markers.

Forest County has 11 hiking trails of various lengths, which offer hiking opportunities for every range of ability. Three of these trails, the Dendro-Eco, Franklin Lake, and Hidden Lake trails, have interpretive markers.

Forest County has 15 campgrounds within the Nicolet National Forest, a county campground, a Sokaogon Chippewa campground, and 8 private campgrounds.

There are 314.5 miles of funded snowmobile trails in Forest County. These trails include the 100-mile Snow Safari, the Three Lakes Trails, the Brule River Trails, the Lumberjack Memorial Trails, and the Tombstone-Pickerel Trails.

The Nicolet Golf Course is located in Laona, and there is a logging museum in Wabeno.

The Lumberjack Special and Camp Five Museum in Laona operates during the summer season.

Attractions include a blacksmith shop, logging museum, ecology walk, petting zoo, forest tour, and a pontoon ride on the Rat River. Steam trains depart every 2 hours for a round-trip excursion.

The soils of the survey area are rated in table 10 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewer lines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation also are important. Soils that are subject to flooding are limited for recreational uses by the duration and intensity of flooding and the season when flooding occurs. In planning recreational facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 10, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or a combination of these.

The information in table 10 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 13 and interpretations for dwellings without basements and for local roads and streets in table 12.

Camp areas require site preparation, such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils are only gently sloping and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

Paths and trails for hiking and horseback riding should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use. They have moderate slopes and no stones or boulders on the surface. The suitability of the soil for tees or greens is not considered in rating the soils.

Wildlife Habitat

Robert D. Weihrouch, biologist, Natural Resources Conservation Service, helped prepare this section.

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The species and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. The diversity of habitat types is of major importance. Land use also is a factor. Forest County has a diversity of wildlife habitats that sustain species suited to forest areas as well as farmland. The wooded wetlands scattered throughout the county add to the diversity of habitats. The quality of wildlife habitat improves where the upland forests are associated with adjacent wetlands.

In general, the sandy soils have open areas, which promote grass, shrub, and oak woodlands. Loamy and silty soils favor sugar maple hardwood forests, which have dense canopies and provide little understory food and cover. Wildlife habitat can be created or improved by maintaining the existing plant cover or by promoting the natural establishment of desirable plants.

The majority of land in Forest County is forested. More than half of the woodland is part of the Nicolet National Forest. Wildlife species in the densely canopied hardwood forests include black bear, bobcat, coyote, porcupine, snowshoe hare, red squirrel, flying squirrel, and white-tailed deer. Pine marten and fisher, reintroduced in the 1960's and 1970's, are now common in the forests. Forest birds include thrushes, flycatchers, warblers, vireos, woodpeckers, broadwinged hawks, bald eagles, and barred owls.

The more open oak-aspen forest, which includes scattered wetlands, provides excellent habitat for white-tailed deer, black bear, coyote, ruffed grouse, woodcock, snowshoe hare, red squirrels, gray squirrels, porcupine, and bald eagles. Maintaining aspen of different age classes provides optimum food and cover for these wildlife species. Birds that frequent disturbed or open woodland areas include chickadees, goldfinches, bluejays, and great horned owls.

Most agricultural land is in the southern half of the county. Cropland, open fields, and edge areas provide specific habitat elements. Wildlife species typical of agricultural areas include white-tailed deer (fig. 19), black bear, raccoon, skunk, badger, woodchuck, red fox, cottontail rabbit, and coyote. Grassland birds associated with agricultural areas include meadowlarks, bluebirds, sparrows, and red-tailed hawks. Ruffed grouse, woodcock, gray squirrels, and red squirrels are common in the adjacent woodlots.

Lakes, streams, wetlands, and riparian areas provide important habitat for waterfowl, furbearers, reptiles, and amphibians. Although the county is not on a principal flyway, ducks and geese migrate through the area. Wood ducks, mallards, black ducks, blue-winged teal, mergansers, and great blue herons are common in streams and beaver ponds throughout the county. Loons, marsh birds, shore birds, bald eagles, and osprey live and feed along the larger lakes and rivers. White-tailed deer, black bear, bobcat, snowshoe hare, red squirrels, raccoon, fisher, otter, mink, beaver, muskrat, ruffed grouse, sharptail grouse, woodcock, and red-shouldered hawks can be found in areas of wetland and riparian habitat. Conifer swamps and hemlock stands provide winter cover for deer.

The paragraphs that follow provide some generalized information about the kinds of wildlife and wildlife habitat in areas of specific soils.

Most areas of Wabeno, Goodwit, Mudlake, Padus, Laona, Sarona, and Argonne soils are private and commercial woodlands or are part of the Nicolet National Forest. A few areas are cropland or wetland. The ridge-swale landscape provides diverse wildlife habitat types. The major tree species in areas of the Wabeno, Goodwit, Padus, Laona, Sarona, and Argonne soils and in the upland areas of Wabeno, Goodwit, and Mudlake soils are sugar maple, American basswood, white ash, yellow birch, eastern hophornbeam, American elm, northern red oak, red maple, paper birch, and eastern hemlock. These uplands produce some of the best timber in the county but provide little understory food and cover for wildlife. The habitat is important for many canopy-nesting species of songbirds and hardwood forest wildlife species. Scattered areas of Wabeno, Goodwit, Mudlake, and Padus soils that are used as cropland provide habitat for wildlife species typical of agricultural areas.

The swales and creeks provide good habitat for wildlife species associated with wetlands. The major tree species are eastern hemlock, red maple, balsam fir, black spruce, white spruce, black ash, eastern white pine, and northern whitecedar.

The bogs and swamps typical of areas of Lupton and Loxley soils support some rare and interesting plants and wildlife species that rely specifically on this habitat type. These areas generally support wetland plants, such as leatherleaf, bog rosemary, pale laurel, Labrador tea, and sphagnum moss. Tree species include black spruce, tamarack, northern whitecedar, balsam fir, black ash, American elm, and red maple. These soils provide good habitat for wildlife species associated with wetlands and are winter deer yarding areas.

Most areas of Padus, Stambaugh, and Pence soils are woodland, but some areas are cropland or wetland. The variety of soil types provides diverse types of wildlife habitat. The major tree species are sugar maple, American basswood, white ash, yellow birch, paper birch, eastern hophornbeam, eastern hemlock, quaking aspen, American elm, white spruce, eastern white pine, northern red oak, balsam fir, and red maple. Red pine plantations also are in areas of these soils. Scattered areas of wetland support northern whitecedar, balsam fir, black ash, and tamarack. These soils provide good hardwood forest and some agricultural and wetland habitats.

Loamy, sandy, and mucky soils, such as Pence, Vilas, and Lupton, are characterized by upland forest and wooded swamps. The major upland tree species include eastern hemlock, sugar maple, red maple, yellow birch, American basswood, eastern white pine, balsam fir, white spruce, paper birch, jack pine, red pine, northern red oak, northern pin oak, and quaking aspen. Low areas support black spruce, tamarack, northern whitecedar, American elm, black ash, and alder. These soils provide excellent habitat for upland and wetland wildlife.



Figure 19.—A white-tailed deer in an old field on the edge of a forest.

In table 11, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flooding. Soil temperature and soil moisture also are considerations. Examples of grain and seed crops are corn, wheat, oats, and barley.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flooding, and slope. Soil temperature and soil moisture also are considerations. Examples of grasses and legumes are bluegrass, timothy, bromegrass, clover, and alfalfa.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flooding. Soil temperature and soil moisture also are considerations. Examples of wild herbaceous plants are pigweed, lambsquarter, goldenrod, and common yarrow.

Hardwood trees and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage. Soil properties and features that affect the growth of hardwood trees and shrubs are depth of the root zone, available water capacity, and wetness. Examples of these plants are oak, aspen, cherry, dogwood, beaked hazelnut, raspberry, blackberry, and blueberry. Examples of fruit-producing shrubs that are suitable for planting on soils rated *good* are Russian-olive, highbush cranberry, and crabapple.

Coniferous plants furnish browse and seeds. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine, spruce, fir, cedar, and hemlock.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, slope, and surface stoniness. Examples of wetland plants are smartweed, wild millet, wild rice, cordgrass, rushes, sedges, and reeds.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. Wildlife attracted to these areas include meadowlark, field sparrow, cottontail, and red fox.

Habitat for woodland wildlife consists of areas of deciduous and/or coniferous plants and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include ruffed grouse, woodcock, thrushes, woodpeckers, squirrels, snowshoe hare, raccoon, deer, and bear.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, herons, shore birds, muskrat, mink, and beaver.

Further information on habitat management for different species of wildlife can be obtained from the local office of the Natural Resources Conservation Service or the Wisconsin Department of Natural Resources.

Engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. Ratings are given for building site development, sanitary facilities, construction materials, and water management. The ratings are based on observed performance of the soils and on the data in the tables described under the heading “Soil Properties.”

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not

eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations should be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 or 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kinds of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to evaluate the potential of areas for residential, commercial, industrial, and recreational uses; make preliminary estimates of construction conditions; evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; plan detailed onsite investigations of soils and geology; locate potential sources of gravel, sand, earthfill, and topsoil; plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey, can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

Building Site Development

Table 12 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, or other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and depth to the water table.

Dwellings and *small commercial buildings* are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrinking and swelling, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, slope, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 or 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material; a base of gravel, crushed rock, or stabilized soil material; and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the

engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic-supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock or to a cemented pan, and the available water capacity in the upper 40 inches affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

Sanitary Facilities

Table 13 shows the degree and kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

The table also shows the suitability of the soils for use as daily cover for landfill. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to filter the effluent effectively. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

The table gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage resulting from rapid permeability in the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground-water pollution. Ease of excavation and revegetation should be considered.

The ratings in the table are based on soil properties, site features, and observed performance of

the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, and soil reaction affect trench landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, rock fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to soil blowing.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as the final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

Construction Materials

Table 14 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a *probable* or *improbable* source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help to determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, a low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have a moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet and have a water table at a depth of less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and *gravel* are natural aggregates suitable for commercial use with a minimum of processing. They are used in many kinds of construction. Specifications for each use vary widely. In table 14, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40

inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable, loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are naturally fertile or respond well to fertilizer and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel or stones, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel or stones, have slopes of more than 15 percent, or have a seasonal high water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

Water Management

Table 15 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas and for embankments, dikes, and levees. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, irrigation, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders or organic matter. A high water table affects the amount of usable material. It also affects trafficability.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a cemented pan, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and the potential for frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone. Availability of drainage outlets is not considered in the ratings.

Irrigation is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are affected by depth to the water table, the need for drainage, flooding, available water capacity, intake

rate, permeability, erosion hazard, and slope. The construction of a system is affected by large stones and depth to bedrock or to a cemented pan. The performance of a system is affected by the depth of the root zone and by soil reaction.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to control water erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of soil blowing or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A hazard of soil blowing, low available water capacity, restricted rooting depth, toxic substances, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

Soil Properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics. These results are reported in table 19.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help to characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classification, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

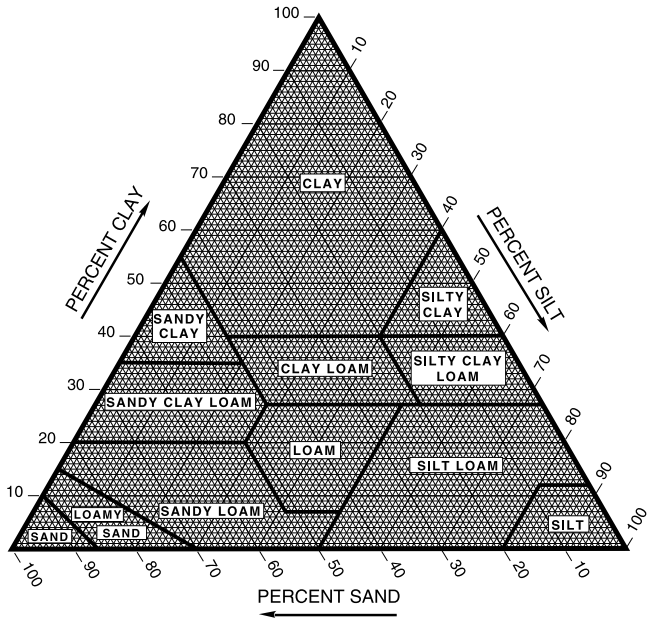


Figure 20.—Percentages of clay, silt, and sand in the basic USDA soil textural classes.

Engineering Index Properties

Table 16 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under the heading "Soil Series and Their Morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter (fig. 20). "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as about 15 percent, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system (ASTM, 2001) and the system adopted by the American Association of State Highway and Transportation Officials (AASHTO, 2000).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting

engineering properties of two groups can have a dual classification, for example, CL-ML.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest. The AASHTO classification for soils tested, with group index numbers in parentheses, is given in table 19.

Rock fragments larger than 10 inches in diameter and 3 to 10 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of grain-size distribution, liquid limit, and plasticity index are generally rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

Physical and Chemical Properties

Table 17 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Depth to the upper and lower boundaries of each layer is indicated.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In the table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earthmoving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at $^1/_3$-bar moisture tension. Weight is determined after the soil is dried at 105 degrees C. In table 17, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability (K_{sat}) refers to the ability of a soil to transmit water or air. The term “permeability,” as used in soil surveys, indicates saturated hydraulic conductivity (K_{sat}). The estimates in the table indicate the rate of water movement, in inches per hour, when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems and septic tank absorption fields.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect retention of water and depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an

important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on the basis of measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; *high*, 6 to 9 percent; and *very high*, greater than 9 percent.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.02 to 0.64. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor Kf indicates the erodibility of the fine-earth fraction, or the material less than 2 millimeters in size.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to soil blowing in cultivated areas. The groups indicate the susceptibility to soil blowing. The soils assigned to group 1 are the most susceptible to soil blowing, and those assigned to group 8 are the least susceptible. The groups are as follows:

1. Coarse sands, sands, fine sands, and very fine sands.
2. Loamy coarse sands, loamy sands, loamy fine sands, loamy very fine sands, ash material, and sapric soil material.
3. Coarse sandy loams, sandy loams, fine sandy loams, and very fine sandy loams.

4L. Calcareous loams, silt loams, clay loams, and silty clay loams.

4. Clays, silty clays, noncalcareous clay loams, and silty clay loams that are more than 35 percent clay.
5. Noncalcareous loams and silt loams that are less than 20 percent clay and sandy clay loams, sandy clays, and hemic soil material.
6. Noncalcareous loams and silt loams that are more than 20 percent clay and noncalcareous clay loams that are less than 35 percent clay.
7. Silts, noncalcareous silty clay loams that are less than 35 percent clay, and fibric soil material.
8. Soils that are not subject to soil blowing because of rock fragments on the surface or because of surface wetness.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In table 17, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter in a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

Soil and Water Features

Table 18 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low

runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to two hydrologic groups in the table, the first letter is for drained areas and the second is for undrained areas.

Flooding, the temporary inundation of an area, is caused by overflowing streams or by runoff from adjacent slopes. Water standing for short periods after rainfall or snowmelt is not considered flooding, and water standing in swamps and marshes is considered ponding rather than flooding.

The table gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions (the chance of flooding is nearly 0 percent to 5 percent in any year); *occasional* that it occurs, on the average, once or less in 2 years (the chance of flooding is 5 to 50 percent in any year); and *frequent* that it occurs, on the average, more than once in 2 years (the chance of flooding is more than 50 percent in any year). Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, *long* if 7 days to 1 month, and *very long* if more than 1 month. Probable dates are expressed in months. About two-thirds to three-fourths of all flooding occurs during the stated period.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and little or no horizon development.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The estimates are based mainly on observations of the water table at selected sites and on the evidence of a saturated zone, namely grayish colors or mottles (redoximorphic features) in the soil. Indicated in table 18 are depth to the seasonal high water table, the kind of water table, and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in the table.

An *apparent* water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. A *perched* water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Two numbers in the column showing depth to the water table indicate the normal range in depth to a saturated zone. Depth is given to the nearest half foot. The first numeral in the range indicates the highest water level. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. “More than 6.0” indicates that the water table is below a depth of 6 feet or that it is within a depth of 6 feet for less than a month.

Depth to bedrock is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is either soft or hard. If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavation.

Subsidence is the settlement of organic soils or of saturated mineral soils of very low density. Subsidence generally results from either desiccation and shrinkage or oxidation of organic material, or both, following drainage. Subsidence takes place gradually, usually over a period of several years. The table shows the expected total subsidence, which usually is a result of drainage.

Potential frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of

segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured, clayey soils that have a high water table in winter are the most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage mainly to pavements and other rigid structures.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors results in a severe hazard of corrosion. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low, moderate,* or *high,* is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion also is expressed as *low, moderate,* or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

Engineering Index Test Data

Table 19 shows laboratory test data for several pedons sampled at carefully selected sites in the survey area. The pedons are representative of the series described in the section “Soil Series and Their Morphology.” The soil samples were tested by the Wisconsin Department of Transportation, Division of Highways and Transportation Facilities.

The testing methods generally are those of the American Association of State Highway and Transportation Officials (AASHTO) or the American Society for Testing and Materials (ASTM).

The tests and methods are AASHTO classification—M 145 (AASHTO), D 3282 (ASTM); Unified classification—D 2487 (ASTM); Mechanical analysis—T 88 (AASHTO), D 422 (ASTM), D 2217 (ASTM); Liquid limit—T 89 (AASHTO), D 4318 (ASTM); Plasticity index—T 90 (AASHTO), D 4318 (ASTM); and Moisture density—T 99 (AASHTO), D 698 (ASTM).

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (Soil Survey Staff, 1999). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. Table 20 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. Twelve soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Spodosol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Aquod (*Aqu*, meaning water, plus *od*, from Spodosol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; type of saturation; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Endoaquods (*Endo*, meaning endosaturation, plus *aquod*, the suborder of the Spodosols that has aquic conditions).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic subgroup is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other taxonomic class. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Endoaquods.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Generally, the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineralogy class, cation-exchange activity class, soil temperature regime, soil depth, and reaction class. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is sandy, mixed, frigid Typic Endoaquods.

SERIES. The series consists of soils within a family that have horizons similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile.

Soil Series and Their Morphology

In this section, each soil series recognized in the survey area is described. Characteristics of the soil and the material in which it formed are identified for each series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the "Soil Survey Manual" (Soil Survey Division Staff, 1993). Many of the technical terms used in the descriptions are defined in "Soil Taxonomy" (Soil Survey Staff, 1999). Unless otherwise indicated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

Argonne Series

Depth class: Moderately deep to a fragipan
Drainage class: Moderately well drained
Permeability: Moderate in the upper part, slow in the fragipan, and moderate or moderately rapid in the substratum
Landform: Drumlins and moraines
Parent material: Primarily loamy deposits underlain by sandy or loamy glacial till or glacial mudflow sediment

Slope range: 1 to 6 percent

Taxonomic classification: Coarse-loamy, mixed, frigid Oxyaquic Fragiorthods

Typical Pedon

Argonne sandy loam, in an area of Argonne-Sarwet sandy loams, 1 to 6 percent slopes, very stony, approximately 1,250 feet west and 850 feet north of the southeast corner of sec. 26, T. 36 N., R. 16 E.

Oa—0 to 2 inches; muck (sapric material, which is a mat of partially decomposed forest litter), black (10YR 2/1) broken face and rubbed; about 20 percent fiber, 5 percent rubbed; weak fine granular structure; very friable; many very fine and fine roots and common medium and coarse roots; very strongly acid (pH 5.0 in water 1:1); abrupt wavy boundary.

E—2 to 5 inches; brown (7.5YR 5/2) sandy loam, pinkish gray (7.5YR 7/2) dry; weak thick platy structure; friable; many very fine and fine roots and common medium and coarse roots; about 1 percent gravel; strongly acid; clear wavy boundary.

Bs1—5 to 9 inches; dark brown (7.5YR 3/4) sandy loam; weak fine subangular blocky structure; friable; many very fine and fine roots and common medium and coarse roots; about 1 percent gravel; very strongly acid; clear wavy boundary.

Bs2—9 to 15 inches; brown (7.5YR 4/4) sandy loam; weak medium subangular blocky structure; friable; common very fine and fine roots and few medium and coarse roots; about 1 percent gravel; very strongly acid; clear wavy boundary.

E/B—15 to 29 inches; 60 percent brown (10YR 5/3) sandy loam (E´), very pale brown (10YR 7/3) dry; moderate medium platy structure; friable; tonguing into and surrounding remnants of brown (7.5YR 4/4) sandy loam (Bt); moderate medium subangular blocky structure; friable; few very fine and fine roots; few faint brown (7.5YR 4/3) clay films on faces of peds; about 5 percent gravel; strongly acid; clear wavy boundary.

B/Ex—29 to 39 inches; 60 percent brown (7.5YR 4/4) sandy loam (Bt); moderate coarse subangular blocky structure; firm; brittle; few faint brown (7.5YR 4/3) clay films on faces of peds; penetrated by tongues of brown (10YR 5/3) sandy loam (E´), very pale brown (10YR 7/3) dry; moderate medium subangular blocky structure; firm; brittle; tends to part along horizontal cleavage planes inherited from the parent material; few very fine and fine roots; common fine distinct and prominent strong brown (7.5YR 4/6) masses of iron accumulation; about 10 percent gravel and 1 percent cobbles; strongly acid; clear wavy boundary.

Btx—39 to 54 inches; brown (7.5YR 4/4) sandy loam; moderate coarse subangular blocky structure; firm; brittle; tends to part along horizontal cleavage planes inherited from the parent material; few faint brown (7.5YR 4/3) clay films on faces of peds; few fine distinct strong brown (7.5YR 4/6) masses of iron accumulation; about 12 percent gravel and 1 percent cobbles; slightly acid; clear wavy boundary.

C—54 to 82 inches; dark yellowish brown (10YR 4/4) gravelly sandy loam; massive; friable; about 20 percent gravel and 1 percent cobbles; slightly acid.

Range in Characteristics

Thickness of the solum: 40 to more than 60 inches
Depth to fragipan: 20 to 40 inches
Content of gravel: 0 to 10 percent in the upper part of the solum; 5 to 30 percent in the lower part of the solum and in the substratum
Content of cobbles: 0 to 10 percent in the upper part of the solum; 0 to 20 percent in the lower part of the solum and in the substratum
Content of stones: 0 to 5 percent throughout the profile
Percent of surface covered by stones: 0.1 to 3.0
Note: Unless otherwise stated, depths and thicknesses are measured from the top of the mineral soil.

O horizon:
Hue—10YR, 7.5YR, or N
Value—2 to 3
Chroma—0 to 2
Texture—sapric or hemic material

A horizon (if it occurs):
Hue—10YR, 7.5YR, or 5YR
Value—2 to 3
Chroma—1 or 2
Texture—sandy loam

E horizon:
Hue—10YR, 7.5YR, or 5YR
Value—4 to 7
Chroma—2 or 3
Texture—sandy loam

Bs horizon:
Hue—7.5YR or 5YR
Value—3 or 4
Chroma—4
Texture—sandy loam or fine sandy loam

E´ part of the E/B and B/Ex horizons:
Hue—10YR or 7.5YR

Value—4 to 7
Chroma—2 or 3
Texture—sandy loam, loamy sand, or the gravelly or cobbly analogs of these textures

Btx horizon and Bt part of the E/B and B/Ex horizons:
Hue—10YR or 7.5YR
Value—3 or 4
Chroma—4 or 6
Texture—sandy loam, gravelly sandy loam, or cobbly sandy loam

C horizon:
Hue—10YR or 7.5YR
Value—3 to 5
Chroma—4 or 6
Texture—loamy sand, sandy loam, or the gravelly or cobbly analogs of these textures

Au Gres Series

Depth class: Very deep
Drainage class: Somewhat poorly drained
Permeability: Rapid
Landform: Outwash plains and stream terraces
Parent material: Sandy glacial outwash
Slope range: 0 to 2 percent

Taxonomic classification: Sandy, mixed, frigid Typic Endoaquods

Typical Pedon

Au Gres loamy sand, 0 to 2 percent slopes, approximately 100 feet west and 1,100 feet north of the southeast corner of sec. 32, T. 35 N., R. 12 E.

A—0 to 2 inches; black (5YR 2.5/1) loamy sand, gray (5YR 5/1) dry; weak fine granular structure; very friable; many very fine and fine, common medium, and few coarse roots; very strongly acid; abrupt wavy boundary.
E—2 to 4 inches; reddish gray (5YR 5/2) loamy sand, pinkish gray (7.5YR 6/2) dry; weak fine subangular blocky structure parting to weak thin platy; very friable; many very fine and fine, common medium, and few coarse roots; very strongly acid; abrupt wavy boundary.
Bhs—4 to 7 inches; dark reddish brown (5YR 3/3) loamy sand; weak fine and medium subangular blocky structure; very friable; common very fine and fine roots and few medium and coarse roots; few black (10YR 2/1) soft iron accumulations; few fine faint reddish brown (5YR 5/3) masses of iron accumulation; very strongly acid; clear wavy boundary.
Bs—7 to 29 inches; brown (7.5YR 4/4) loamy sand; weak medium subangular blocky structure; very friable; few very fine, fine, and medium roots; common medium prominent yellowish red (5YR 4/6) masses of iron accumulation; very strongly acid; clear wavy boundary.
BC—29 to 46 inches; dark yellowish brown (10YR 4/6) sand; single grain; loose; common medium distinct strong brown (7.5YR 5/6) masses of iron accumulation; strongly acid; gradual wavy boundary.
C—46 to 60 inches; brown (10YR 5/3) sand; single grain; loose; common medium prominent strong brown (7.5YR 5/6) masses of iron accumulation; slightly acid.

Range in Characteristics

Thickness of the solum: 20 to 40 inches
Content of gravel: 0 to 10 percent throughout the profile

O horizon (if it occurs):
Hue—10YR, 7.5YR, 5YR, or N
Value—2 to 3
Chroma—0 to 2
Texture—sapric or hemic material

A horizon:
Hue—10YR, 7.5YR, 5YR, or N
Value—2 to 3
Chroma—0 to 2
Texture—loamy sand

E horizon:
Hue—10YR, 7.5YR, or 5YR
Value—4 to 6
Chroma—2
Texture—loamy sand

Bhs horizon:
Hue—7.5YR or 5YR
Value—2 or 3
Chroma—2 or 3
Texture—loamy sand

Bs horizon:
Hue—7.5YR or 5YR
Value—3 or 4
Chroma—4
Texture—loamy sand or sand

C horizon:
Hue—10YR or 7.5YR
Value—4 to 6
Chroma—3 to 8
Texture—sand

Beseman Series

Depth class: Very deep
Drainage class: Very poorly drained
Permeability: Moderate or moderately rapid in the organic material and moderately slow in the substratum
Landform: Outwash plains, glacial lake plains, and moraines
Parent material: Sphagnum moss and herbaceous organic material 16 to 51 inches thick over loamy or silty deposits
Slope range: 0 to 1 percent

Taxonomic classification: Loamy, mixed, dysic Terric Borosaprists

Typical Pedon

Beseman peat, in an area of Loxley, Beseman, and Dawson peats, 0 to 1 percent slopes, approximately 1,995 feet west and 1,200 feet south of the northeast corner of sec. 28, T. 38 N., R. 13 E.

Oi—0 to 12 inches; peat, dark brown (10YR 3/3) broken face and rubbed; about 90 percent fiber, 50 percent rubbed; weak coarse subangular blocky structure; very friable; many fine roots; fibers are primarily sphagnum moss; extremely acid (pH 4.0 in water 1:1); clear wavy boundary.
Oa1—12 to 22 inches; muck, dark reddish brown (5YR 2.5/2) broken face and rubbed; about 45 percent fiber, 5 percent rubbed; weak coarse subangular blocky structure; friable; few fine roots; fibers are primarily herbaceous; extremely acid (pH 4.0 in water 1:1); gradual wavy boundary.
Oa2—22 to 36 inches; muck, black (5YR 2.5/1) broken face and rubbed; about 40 percent fiber, 5 percent rubbed; moderate coarse subangular blocky structure; friable; few fine roots; fibers are primarily herbaceous; about 10 percent mineral material; extremely acid (pH 4.0 in water 1:1); abrupt wavy boundary.
Cg—36 to 60 inches; dark gray (5Y 4/1) silt loam; massive; friable; about 3 percent gravel; few highly decomposed root fibers in channels; very strongly acid.

Range in Characteristics

Thickness of organic material: 16 to 51 inches
Kind of organic material: Upper layer—peat; lower layers—dominantly muck (thin layers of mucky peat or peat in some pedons)
Content of woody fragments: 0 to 10 percent

Oi horizon:
Hue—10YR, 7.5YR, or 5YR
Value—2 to 3
Chroma—2 or 3
Texture—peat

Oa horizon:
Hue—10YR, 7.5YR, or 5YR
Value—2 to 3
Chroma—1 or 2
Texture—muck

C horizon:
Hue—5Y, 2.5Y, 10YR, or 7.5YR
Value—4 to 6
Chroma—1 to 3
Texture—silt loam, loam, sandy loam, or fine sandy loam

Capitola Series

Depth class: Very deep
Drainage class: Poorly drained
Permeability: Moderate or moderately slow in the solum and moderately slow in the substratum
Landform: Drumlins and moraines
Parent material: Primarily silty deposits underlain by sandy or loamy glacial till or glacial mudflow sediment
Slope range: 0 to 2 percent

Taxonomic classification: Coarse-loamy, mixed, frigid Mollic Epiaqualfs

Typical Pedon

Capitola muck, 0 to 2 percent slopes, very stony, approximately 450 feet east and 2,000 feet south of the northwest corner of sec. 17, T. 35 N., R. 12 E.

Oa—0 to 5 inches; muck, black (10YR 2/1) broken face, very dark brown (10YR 2/2) rubbed; about 45 percent fiber, 5 percent rubbed; weak medium granular structure; friable; many very fine and fine roots; fibers are primarily herbaceous; very strongly acid (pH 4.8 in water 1:1); abrupt smooth boundary.
Bg—5 to 22 inches; dark grayish brown (10YR 4/2) silt loam; moderate medium and coarse subangular blocky structure; friable; few very fine and fine roots; about 1 percent cobbles; strongly acid; clear wavy boundary.
2Btg—22 to 36 inches; dark grayish brown (10YR 4/2) sandy loam; weak medium subangular blocky structure; friable; few faint very dark grayish brown (10YR 3/2) clay films on faces of some peds; few fine prominent yellowish red (5YR 4/6) masses of iron accumulation; about 10 percent gravel and 1

percent cobbles; slightly acid; gradual wavy boundary.
2Cg—36 to 60 inches; brown (7.5YR 5/2) sandy loam; massive; friable; about 10 percent gravel and 1 percent cobbles; slightly acid.

Range in Characteristics

Thickness of the solum: 20 to 40 inches
Thickness of the silty mantle: 15 to 36 inches
Content of gravel: 0 to 10 percent in the upper part of the solum; 5 to 25 percent in the lower part of the solum and in the substratum
Content of cobbles: 0 to 15 percent throughout the profile
Content of stones: 0 to 5 percent throughout the profile
Percent of surface covered by stones: 0.1 to 3.0

Oa horizon:
Hue—10YR, 7.5YR, 5YR, or N
Value—2 to 3
Chroma—0 to 2
Texture—muck

A horizon (if it occurs):
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—silt loam

Bg horizon:
Hue—2.5Y, 10YR, or 7.5YR
Value—4 to 6
Chroma—1 or 2
Texture—silt loam

2Btg horizon:
Hue—7.5YR or 5YR
Value—4 to 6
Chroma—1 or 2
Texture—sandy loam or gravelly sandy loam

2C horizon:
Hue—7.5YR or 5YR
Value—4 to 6
Chroma—2 to 4
Texture—sandy loam, loamy sand, or the gravelly analogs of these textures

Cathro Series

Depth class: Very deep
Drainage class: Very poorly drained
Permeability: Moderately slow to moderately rapid in the organic material and moderately slow or moderate in the substratum
Landform: Outwash plains, glacial lake plains, and moraines
Parent material: Herbaceous organic material 16 to 51 inches thick over loamy or silty deposits
Slope range: 0 to 1 percent

Taxonomic classification: Loamy, mixed, euic Terric Borosaprists

Typical Pedon

Cathro muck, in an area of Lupton, Cathro, and Markey mucks, 0 to 1 percent slopes, approximately 150 feet east and 2,300 feet south of the northwest corner of sec. 30, T. 35 N., R. 15 E.

Oa1—0 to 8 inches; muck, black (N 2.5/0) broken face and rubbed; about 45 percent fiber, 9 percent rubbed; moderate fine granular structure; very friable; many very fine and fine roots and common medium roots; fibers are primarily herbaceous; neutral (pH 7.0 in water 1:1); clear wavy boundary.
Oa2—8 to 16 inches; muck, black (N 2.5/0) broken face, black (10YR 2/1) rubbed; about 40 percent fiber, 4 percent rubbed; moderate fine granular structure; very friable; common very fine and fine roots and few medium roots; fibers are primarily herbaceous; neutral (pH 6.9 in water 1:1); clear wavy boundary.
Oa3—16 to 30 inches; muck, black (N 2.5/0) broken face, black (10YR 2/1) rubbed; about 40 percent fiber, 4 percent rubbed; weak medium subangular blocky structure; very friable; fibers are primarily herbaceous; about 3 percent mineral material; neutral (pH 7.2 in water 1:1); abrupt wavy boundary.
Cg1—30 to 37 inches; gray (5Y 5/1) silt loam; massive; friable; black (10YR 2/1) organic staining in the upper 1/2 inch; slightly alkaline; abrupt wavy boundary.
Cg2—37 to 45 inches; grayish brown (10YR 5/2) sandy loam; massive; friable; few fine distinct yellowish brown (10YR 5/4) masses of iron accumulation; about 4 percent gravel; slightly alkaline; gradual wavy boundary.
C—45 to 60 inches; brown (10YR 5/3) sandy loam; massive; friable; common medium distinct dark yellowish brown (10YR 4/4) masses of iron accumulation; about 4 percent gravel; slightly alkaline.

Range in Characteristics

Thickness of organic material: 16 to 51 inches
Kind of organic material: Dominantly muck; thin layers of mucky peat or muck in some pedons

Content of woody fragments: 0 to 10 percent

Oa horizon:
Hue—10YR, 7.5YR, 5YR, or N
Value—2 to 3
Chroma—0 to 2
Texture—muck

C horizon:
Hue—5Y, 2.5Y, 10YR, or 7.5YR
Value—4 to 6
Chroma—1 to 3
Texture—sandy loam, fine sandy loam, very fine sandy loam, loam, or silt loam

Croswell Series

Depth class: Very deep
Drainage class: Moderately well drained
Permeability: Rapid
Landform: Outwash plains and stream terraces
Parent material: Sandy glacial outwash
Slope range: 0 to 3 percent

Taxonomic classification: Sandy, mixed, frigid Oxyaquic Haplorthods

Typical Pedon

Croswell loamy sand, 0 to 3 percent slopes, approximately 1,340 feet west and 670 feet south of the northeast corner of sec. 14, T. 34 N., R. 14 E.

A—0 to 1 inch; black (10YR 2/1) loamy sand, dark gray (10YR 4/1) dry; weak fine granular structure; very friable; many fine and medium roots; about 1 percent gravel; strongly acid; abrupt smooth boundary.
E—1 to 3 inches; brown (7.5YR 4/2) loamy sand, pinkish gray (7.5YR 7/2) dry; weak medium subangular blocky structure; very friable; many fine and medium roots; about 2 percent gravel; strongly acid; abrupt smooth boundary.
Bs1—3 to 6 inches; dark reddish brown (5YR 3/4) loamy sand; weak medium subangular blocky structure; very friable; many fine and medium roots; about 2 percent gravel; strongly acid; abrupt wavy boundary.
Bs2—6 to 22 inches; brown (7.5YR 4/4) loamy sand; weak medium subangular blocky structure; very friable; common fine and medium roots; about 2 percent gravel; moderately acid; abrupt wavy boundary.
Bs3—22 to 28 inches; brown (7.5YR 4/4) loamy sand; weak medium subangular blocky structure; very friable; few fine and medium roots; about 2 percent gravel; moderately acid; clear wavy boundary.
C1—28 to 36 inches; yellowish brown (10YR 5/4) sand; single grain; loose; common medium prominent strong brown (7.5YR 5/6) masses of iron accumulation; about 2 percent gravel; strongly acid; clear wavy boundary.
C2—36 to 60 inches; yellowish brown (10YR 5/6) sand; single grain; loose; common medium distinct strong brown (7.5YR 5/6) masses of iron accumulation; about 2 percent gravel; slightly acid.

Range in Characteristics

Thickness of the solum: 20 to 40 inches
Content of gravel: 0 to 10 percent throughout the profile

O horizon (if it occurs):
Hue—10YR, 7.5YR, 5YR, or N
Value—2 to 3
Chroma—0 to 2
Texture—sapric or hemic material

A horizon:
Hue—10YR, 7.5YR, 5YR, or N
Value—2 to 3
Chroma—0 to 2
Texture—loamy sand

E horizon:
Hue—10YR or 7.5YR
Value—4 to 6
Chroma—2
Texture—sand or loamy sand

Bs horizon:
Hue—7.5YR or 5YR
Value—3 or 4
Chroma—4
Texture—sand or loamy sand

C horizon:
Hue—10YR or 7.5YR
Value—4 to 6
Chroma—3 to 6
Texture—sand

Cublake Series

Depth class: Very deep
Drainage class: Moderately well drained
Permeability: Moderately rapid or rapid in the upper part and moderately slow or moderate in the lower part
Landform: Outwash plains, glacial lake plains, and stream terraces

Parent material: Sandy glacial outwash underlain by stratified lacustrine deposits
Slope range: 0 to 3 percent

Taxonomic classification: Sandy, mixed, frigid Oxyaquic Haplorthods

Typical Pedon

Cublake loamy sand, 0 to 3 percent slopes, approximately 1,830 feet west and 670 feet north of the southeast corner of sec. 12, T. 37 N., R. 16 E.

A—0 to 4 inches; black (10YR 2/1) loamy sand, dark gray (10YR 4/1) dry; weak fine granular structure; very friable; few fine and many coarse roots; about 1 percent gravel; strongly acid; abrupt smooth boundary.
E—4 to 5 inches; brown (7.5YR 4/2) loamy sand, pinkish gray (7.5YR 6/2) dry; weak fine subangular blocky structure; very friable; common fine and few medium roots; about 1 percent gravel; strongly acid; abrupt smooth boundary.
Bs1—5 to 8 inches; reddish brown (5YR 4/4) loamy sand; weak fine subangular blocky structure; very friable; common fine and few medium roots; about 1 percent gravel; strongly acid; abrupt wavy boundary.
Bs2—8 to 13 inches; brown (7.5YR 4/4) sand; weak fine subangular blocky structure; very friable; common fine and few medium roots; about 1 percent gravel; strongly acid; clear wavy boundary.
Bs3—13 to 21 inches; brown (7.5YR 4/4) sand; weak medium subangular blocky structure; very friable; about 3 percent gravel; moderately acid; abrupt wavy boundary.
BC—21 to 34 inches; yellowish brown (10YR 5/4) sand; weak medium subangular blocky structure; very friable; common coarse distinct strong brown (7.5YR 5/8) masses of iron accumulation; about 3 percent gravel; moderately acid; clear wavy boundary.
C1—34 to 49 inches; yellowish brown (10YR 5/6) sand; single grain; loose; many medium distinct yellowish brown (10YR 5/8) masses of iron accumulation; single grain; loose; about 3 percent gravel; moderately acid; abrupt wavy boundary.
2C2—49 to 60 inches; dark yellowish brown (10YR 4/4), stratified very fine sandy loam and silt loam; thin strata of brownish yellow (10YR 6/6) fine sand; massive; friable; many medium distinct yellowish brown (10YR 5/8) and few fine faint yellowish brown (10YR 5/4) masses of iron accumulation; about 3 percent gravel; moderately acid.

Range in Characteristics

Thickness of the solum: 20 to 40 inches
Thickness of the sandy mantle: 40 to 60 inches
Content of gravel: 0 to 10 percent in the sandy glacial outwash and 0 to 5 percent in the stratified lacustrine deposits

O horizon (if it occurs):
Hue—10YR, 7.5YR, 5YR, or N
Value—2 to 3
Chroma—0 to 2
Texture—sapric or hemic material

A horizon:
Hue—10YR or 7.5YR
Value—2 to 3
Chroma—1 or 2
Texture—loamy sand

E horizon:
Hue—10YR or 7.5YR
Value—4 to 6
Chroma—2
Texture—sand or loamy sand

Bs horizon:
Hue—7.5YR or 5YR
Value—3 or 4
Chroma—4
Texture—sand or loamy sand

C horizon:
Hue—10YR or 7.5YR
Value—4 to 6
Chroma—4 or 6
Texture—sand

2C horizon:
Hue—10YR or 7.5YR
Value—4 to 6
Chroma—4 or 6
Texture—stratified silt loam and very fine sandy loam with thin strata of fine sand

Dawson Series

Depth class: Very deep
Drainage class: Very poorly drained
Permeability: Moderately slow to rapid in the organic material and rapid in the substratum
Landform: Outwash plains, glacial lake plains, and moraines
Parent material: Sphagnum moss and herbaceous organic material 16 to 51 inches thick over sandy or sandy and gravelly deposits

Slope range: 0 to 1 percent

Taxonomic classification: Sandy or sandy-skeletal, mixed, dysic Terric Borosaprists

Typical Pedon

Dawson peat, in an area of Loxley, Beseman, and Dawson peats, 0 to 1 percent slopes, approximately 3,000 feet north and 10 feet west of the southeast corner of sec. 7, T. 38 N., R. 18 E., in Florence County, Wisconsin:

Oi—0 to 10 inches; peat, dark reddish brown (5YR 3/4) broken face and rubbed; about 95 percent fiber, 90 percent rubbed; massive; very friable; fibers are primarily sphagnum moss; extremely acid (pH 4.3 in water 1:1); abrupt smooth boundary.

Oa1—10 to 29 inches; muck, dark reddish brown (5YR 2.5/2) broken face and rubbed; about 40 percent fiber, 5 percent rubbed; massive; very friable; fibers are primarily herbaceous; extremely acid (pH 4.3 in water 1:1); clear smooth boundary.

Oa2—29 to 44 inches; muck, dark reddish brown (5YR 2.5/2) broken face and rubbed; about 30 percent fiber, 7 percent rubbed; massive; very friable; fibers are primarily herbaceous; about 5 percent sand; extremely acid (pH 4.3 in water 1:1); abrupt smooth boundary.

C—44 to 60 inches; brown (10YR 4/3) sand; single grain; loose; few thin strata and pockets of loamy fine sand; very strongly acid.

Range in Characteristics

Thickness of organic material: 16 to 51 inches

Kind of organic material: Upper layer—peat; lower layers—dominantly muck (thin layers of mucky peat or peat in some pedons)

Content of woody fragments: 0 to 10 percent

Oi horizon:
Hue—10YR, 7.5YR, or 5YR
Value—3 to 6
Chroma—2 to 4
Texture—peat

Oa horizon:
Hue—10YR, 7.5YR, or 5YR
Value—2 to 3
Chroma—1 or 2
Texture—muck

C horizon:
Hue—10YR, 7.5YR, 5YR, or N
Value—4 to 6
Chroma—0 to 4
Texture—sand, fine sand, loamy fine sand, loamy sand, gravelly loamy sand, or gravelly sand

Fence Series

Depth class: Very deep

Drainage class: Moderately well drained

Permeability: Moderate in the solum and moderately slow in the substratum

Landform: Outwash plains, glacial lake plains, and moraines

Parent material: Primarily silty deposits underlain by stratified lacustrine deposits

Slope range: 0 to 6 percent

Taxonomic classification: Coarse-silty, mixed, frigid Oxyaquic Haplorthods

Typical Pedon

Fence silt loam, 0 to 6 percent slopes, approximately 2,600 feet east and 400 feet south of the northwest corner of sec. 35, T. 34 N., R. 15 E.

A—0 to 2 inches; dark reddish brown (5YR 2.5/2) silt loam, reddish gray (5YR 5/2) dry; moderate medium granular structure; friable; many fine and common medium roots; strongly acid; abrupt smooth boundary.

E—2 to 3 inches; brown (7.5YR 4/2) silt loam, pinkish gray (7.5YR 6/2) dry; weak medium subangular blocky structure; very friable; many fine and common medium roots; strongly acid; abrupt smooth boundary.

Bs—3 to 9 inches; brown (7.5YR 4/4) silt loam; weak fine subangular blocky structure; friable; many fine and common medium roots; strongly acid; clear smooth boundary.

E/B—9 to 17 inches; 80 percent brown (10YR 5/3) silt loam (E´), very pale brown (10YR 7/3) dry; weak thin platy structure; very friable; tonguing into and surrounding remnants of brown (7.5YR 4/4) silt loam (Bt); moderate medium subangular blocky structure; friable; common fine and few medium roots; strongly acid; clear wavy boundary.

B/E1—17 to 27 inches; 75 percent brown (7.5YR 4/4) silt loam (Bt); moderate medium subangular blocky structure; friable; few faint dark brown (7.5YR 3/4) clay films on faces of some peds; penetrated by tongues of brown (10YR 5/3) silt loam (E´), very pale brown (10YR 7/3) dry; weak fine subangular blocky structure; very friable; common fine and few medium roots; about 1 percent gravel; strongly acid; clear wavy boundary.

B/E2—27 to 31 inches; 75 percent brown (7.5YR 4/4)

very fine sandy loam (Bt); weak medium subangular blocky structure; friable; few faint dark brown (7.5YR 3/4) clay films on faces of some peds; penetrated by tongues of brown (10YR 5/3) very fine sandy loam (E´), very pale brown (10YR 7/3) dry; weak fine subangular blocky structure; friable; few fine and medium roots; about 1 percent gravel; strongly acid; clear wavy boundary.

Bt—31 to 42 inches; brown (7.5YR 4/4) very fine sandy loam; weak medium subangular blocky structure; friable; few fine and medium roots; few faint dark brown (7.5YR 3/4) clay films on faces of some peds; about 1 percent gravel; strongly acid; clear wavy boundary.

C—42 to 60 inches; dark yellowish brown (10YR 4/4), stratified very fine sandy loam and silt loam; a few thin strata of fine sand; massive; friable; few fine prominent yellowish red (5YR 5/8) masses of iron accumulation; strongly acid.

Range in Characteristics

Thickness of the solum: 25 to 50 inches

Content of gravel: Less than 2 percent throughout the profile

O horizon (if it occurs):
- Hue—10YR, 7.5YR, or N
- Value—2 to 3
- Chroma—0 to 2
- Texture—sapric or hemic material

A horizon:
- Hue—10YR, 7.5YR, or 5YR
- Value—2 to 3
- Chroma—1 or 2
- Texture—silt loam

E horizon:
- Hue—10YR or 7.5YR
- Value—4 or 5
- Chroma—2 or 3
- Texture—silt loam, silt, or very fine sandy loam

Bs horizon:
- Hue—7.5YR or 5YR
- Value—3 or 4
- Chroma—4
- Texture—silt loam, silt, or very fine sandy loam

E´ part of E/B and B/E horizons:
- Hue—10YR or 7.5YR
- Value—4 or 5
- Chroma—2 or 3
- Texture—silt loam, silt, or very fine sandy loam

Bt horizon and Bt part of E/B and B/E horizons:
- Hue—10YR, 7.5YR, or 5YR
- Value—4 or 5
- Chroma—4 or 6
- Texture—silt loam, silt, or very fine sandy loam

C horizon:
- Hue—10YR or 7.5YR
- Value—4 or 5
- Chroma—3 to 6
- Texture—stratified silt loam and very fine sandy loam with thin strata of fine sand

Flink Series

Depth class: Very deep

Drainage class: Somewhat poorly drained

Permeability: Moderately rapid or rapid in the upper part and moderately slow or moderate in the lower part

Landform: Outwash plains, stream terraces, and glacial lake plains

Parent material: Primarily sandy glacial outwash underlain by stratified lacustrine deposits

Slope range: 0 to 3 percent

Taxonomic classification: Sandy, mixed, frigid Typic Epiaquods

Typical Pedon

Flink loamy sand, 0 to 3 percent slopes, approximately 100 feet east and 2,500 feet north of the southwest corner of sec. 19, T. 36 N., R. 12 E.

Oa—0 to 1 inch; muck (sapric material, which is a mat of partially decomposed forest litter), dark brown (7.5YR 3/2) broken face and rubbed; about 25 percent fiber, 10 percent rubbed; weak fine granular structure; very friable; many very fine and fine roots and few medium roots; strongly acid (pH 5.1 in water 1:1); abrupt smooth boundary.

E—1 to 3 inches; grayish brown (10YR 5/2) loamy sand, light gray (10YR 7/2) dry; weak medium subangular blocky structure parting to weak medium granular; very friable; many fine and medium roots; strongly acid; abrupt wavy boundary.

Bs1—3 to 6 inches; brown (7.5YR 4/4) loamy sand; weak fine subangular blocky structure parting to weak medium granular; very friable; many fine and common medium roots; common fine distinct strong brown (7.5YR 5/6) masses of iron accumulation; strongly acid; abrupt irregular boundary.

Bs2—6 to 18 inches; brown (7.5YR 4/4) loamy sand; weak medium subangular blocky structure parting to weak medium granular; very friable; common

fine and medium roots; common medium prominent yellowish red (5YR 4/6) masses of iron accumulation; moderately acid; clear wavy boundary.

Bs3—18 to 29 inches; brown (7.5YR 4/4) loamy sand; weak coarse subangular blocky structure; very friable; common fine and few medium roots; many coarse prominent dark reddish brown (5YR 3/4) masses of iron accumulation; common dark reddish brown (5YR 3/3) iron and manganese concretions throughout; moderately acid; clear wavy boundary.

C1—29 to 44 inches; dark yellowish brown (10YR 4/4) sand; single grain; loose; few fine roots; many medium prominent strong brown (7.5YR 5/8) masses of iron accumulation; strongly acid; abrupt wavy boundary.

2C2—44 to 61 inches; strong brown (7.5YR 4/6), stratified fine sandy loam and sandy loam; many thin strata of dark yellowish brown (10YR 4/4) sand; massive; friable; many coarse prominent strong brown (7.5YR 5/8) masses of iron accumulation and common medium prominent pinkish gray (7.5YR 6/2) iron depletions; strongly acid.

Range in Characteristics

Thickness of the solum: 25 to 50 inches
Thickness of the sandy mantle: 40 to 60 inches
Content of gravel: 0 to 10 percent throughout the profile
Note: Unless otherwise stated, depths and thicknesses are measured from the top of the mineral soil.

O horizon:
Hue—10YR, 7.5YR, 5YR, or N
Value—2 to 3
Chroma—0 to 2
Texture—sapric or hemic material

A horizon (if it occurs):
Hue—10YR or 7.5YR
Value—2 to 3
Chroma—1 or 2
Texture—loamy sand

E horizon:
Hue—10YR or 7.5YR
Value—4 to 6
Chroma—1 or 2
Texture—loamy sand

Bs horizon:
Hue—7.5YR or 5YR
Value—3 or 4
Chroma—4
Texture—loamy sand or sand

C horizon:
Hue—10YR or 7.5YR
Value—4 to 6
Chroma—3 to 6
Texture—sand

2C horizon:
Hue—10YR or 7.5YR
Value—4 to 6
Chroma—3 to 6
Texture—stratified fine sandy loam and sandy loam with thin strata of sand or stratified silt loam and very fine sandy loam with thin strata of fine sand

Fordum Series

Depth class: Very deep
Drainage class: Poorly drained
Permeability: Moderate or moderately rapid in the upper part and rapid or very rapid in the lower part
Landform: Flood plains
Parent material: Primarily loamy alluvium underlain by sandy or sandy and gravelly deposits
Slope range: 0 to 2 percent

Taxonomic classification: Coarse-loamy, mixed, nonacid, frigid Mollic Fluvaquents

Typical Pedon

Fordum loam, 0 to 2 percent slopes, approximately 995 feet east and 1,660 feet north of the southwest corner of sec. 9, T. 34 N., R. 15 E.

A—0 to 6 inches; very dark gray (10YR 3/1) loam, gray (10YR 5/1) dry; moderate medium subangular blocky structure; friable; common fine and few medium roots; about 3 percent gravel; slightly alkaline; abrupt smooth boundary.

Cg1—6 to 10 inches; dark gray (5Y 4/1) sandy loam; massive; friable; few fine roots; common medium prominent strong brown (7.5YR 4/6) masses of iron accumulation and few medium distinct dark greenish gray (5G 4/1) iron depletions; about 5 percent gravel; slightly alkaline; abrupt smooth boundary.

Cg2—10 to 23 inches; grayish brown (10YR 5/2) sandy loam; massive; friable; many fine to coarse prominent strong brown (7.5YR 5/8) masses of iron accumulation; about 5 percent gravel; neutral; abrupt smooth boundary.

Cg3—23 to 26 inches; gray (5Y 5/1) silt loam;

massive; friable; common medium prominent yellowish brown (10YR 5/8) masses of iron accumulation and few fine prominent gray (10YR 6/1) iron depletions; about 2 percent gravel; neutral; abrupt smooth boundary.

C1—26 to 35 inches; yellowish brown (10YR 5/4) sand; single grain; loose; common coarse prominent strong brown (7.5YR 4/6) masses of iron accumulation; about 12 percent gravel; neutral; clear wavy boundary.

C2—35 to 60 inches; brown (10YR 5/3) gravelly sand; single grain; loose; common coarse distinct yellowish brown (10YR 5/6) masses of iron accumulation; single grain; about 30 percent gravel; slightly alkaline.

Range in Characteristics

Depth to sand or sandy and gravelly deposits: 24 to 40 inches

Content of gravel: 0 to 15 percent in the loamy or silty upper layers; 0 to 60 percent in the sandy or sandy and gravelly lower layers

Content of cobbles: 0 to 10 percent throughout the profile

A horizon:
- Hue—10YR or 7.5YR
- Value—2 to 3
- Chroma—1 to 3
- Texture—loam

Cg horizon:
- Hue—5Y, 2.5Y, 10YR, or 7.5YR
- Value—4 or 5
- Chroma—1 or 2
- Texture—silt loam, loam, sandy loam, or fine sandy loam

C horizon:
- Hue—10YR or 7.5YR
- Value—4 to 6
- Chroma—1 to 4
- Texture—sand, gravelly sand, or very gravelly sand

Gastrow Series

Depth class: Very deep

Drainage class: Somewhat poorly drained

Permeability: Moderate

Landform: Outwash plains, glacial lake plains, and moraines

Parent material: Primarily silty deposits underlain by stratified lacustrine deposits

Slope range: 0 to 3 percent

Taxonomic classification: Coarse-loamy, mixed, frigid Argic Endoaquods

Typical Pedon

Gastrow silt loam, 0 to 3 percent slopes, approximately 100 feet east and 900 feet south of the northwest corner of sec. 27, T. 35 N., R. 14 E.

A—0 to 3 inches; black (10YR 2/1) silt loam, gray (10YR 5/1) dry; weak fine granular structure; friable; many fine and common medium roots; slightly acid; abrupt smooth boundary.

E—3 to 5 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; weak medium platy structure parting to weak fine subangular blocky; friable; common fine and few medium roots; very strongly acid; abrupt wavy boundary.

Bs—5 to 13 inches; brown (7.5YR 4/4) silt loam; moderate medium subangular blocky structure; friable; few fine roots; common fine prominent yellowish red (5YR 4/6) masses of iron accumulation and few fine distinct brown (7.5YR 5/2) iron depletions; very strongly acid; abrupt wavy boundary.

E´—13 to 18 inches; grayish brown (10YR 5/2) silt loam, light gray (10YR 7/2) dry; moderate medium platy structure; friable; few fine roots; common medium prominent strong brown (7.5YR 5/6) masses of iron accumulation; strongly acid; abrupt wavy boundary.

B/E—18 to 29 inches; 60 percent brown (7.5YR 4/4) silt loam (Bt); moderate medium subangular blocky structure; friable; few faint dark brown (7.5YR 3/4) clay films on faces of some peds; many fine prominent yellowish red (5YR 4/6) masses of iron accumulation; penetrated by tongues of brown (7.5YR 5/3) silt loam (E´), pink (7.5YR 7/3) dry; moderate medium subangular blocky structure; friable; few fine roots; very strongly acid; clear wavy boundary.

Bt—29 to 40 inches; brown (7.5YR 4/4) fine sandy loam; moderate medium subangular blocky structure; friable; few fine roots; few faint dark brown (7.5YR 3/4) clay films on faces of peds; few fine distinct brown (7.5YR 5/2) iron depletions and many fine prominent yellowish red (5YR 5/6) masses of iron accumulation; strongly acid; clear wavy boundary.

C—40 to 60 inches; brown (7.5YR 4/4), stratified silt loam and very fine sand; massive; friable; few fine distinct brown (7.5YR 5/2) iron depletions and common fine distinct strong brown (7.5YR 5/6) masses of iron accumulation; slightly acid.

Range in Characteristics

Thickness of the solum: 20 to 45 inches

O horizon (if it occurs):
Hue—10YR, 7.5YR, or N
Value—2 to 3
Chroma—0 to 2
Texture—sapric or hemic material

A horizon:
Hue—10YR or 7.5YR
Value—2 to 3
Chroma—1 or 2
Texture—silt loam

E horizon:
Hue—10YR or 7.5YR
Value—4 to 6
Chroma—2
Texture—silt loam or very fine sandy loam

Bs horizon:
Hue—7.5YR or 5YR
Value—3 or 4
Chroma—4
Texture—silt loam or very fine sandy loam

E´ horizon and E´ part of B/E horizon:
Hue—10YR or 7.5YR
Value—4 or 5
Chroma—2 or 3
Texture—silt loam or very fine sandy loam

Bt horizon and Bt part of B/E horizon:
Hue—7.5YR or 5YR
Value—4 or 5
Chroma—3 or 4
Texture—silt loam, very fine sandy loam, or fine sandy loam

C horizon:
Hue—10YR or 7.5YR
Value—4 or 5
Chroma—3 or 4
Texture—stratified silt loam and very fine sand

Goodman Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate in the upper part and moderate or moderately rapid in the lower part
Landform: Drumlins and moraines
Parent material: Primarily silty deposits underlain by sandy or loamy glacial till or glacial mudflow sediment
Slope range: 6 to 35 percent

Taxonomic classification: Coarse-loamy, mixed, frigid Alfic Haplorthods

Typical Pedon

Goodman silt loam, in an area of Soperton-Goodman silt loams, 15 to 35 percent slopes, very stony, approximately 800 feet west and 2,600 feet south of the northeast corner of sec. 36, T. 36 N., R. 13 E.

Oe—0 to 1 inch; mucky peat (hemic material, which is a mat of partially decomposed forest litter), very dark grayish brown (10YR 3/2) broken face and rubbed; about 40 percent fiber, 20 percent rubbed; weak fine granular structure; very friable; common fine and few medium roots; strongly acid (pH 5.1 in water 1:1); abrupt wavy boundary.
A—1 to 3 inches; black (10YR 2/1) silt loam, gray (10YR 5/1) dry; weak fine granular structure; friable; common fine and few medium roots; strongly acid; abrupt smooth boundary.
E—3 to 5 inches; dark grayish brown (10YR 4/2) silt loam, light gray (10YR 7/2) dry; weak medium platy structure; friable; few fine and medium roots; strongly acid; abrupt smooth boundary.
Bs—5 to 12 inches; brown (7.5YR 4/4) silt loam; weak medium subangular blocky structure; friable; few fine and medium roots; very strongly acid; abrupt smooth boundary.
E/B—12 to 19 inches; 75 percent pale brown (10YR 6/3) silt loam (E´), very pale brown (10YR 7/3) dry; weak medium subangular blocky structure; friable; tonguing into and surrounding remnants of brown (7.5YR 4/4) silt loam (Bt); moderate medium subangular blocky structure; friable; few fine roots; strongly acid; clear wavy boundary.
Bt1—19 to 25 inches; brown (7.5YR 4/4) silt loam; moderate medium subangular blocky structure; friable; few fine roots; common faint dark brown (7.5YR 3/4) clay films on faces of peds; very strongly acid; abrupt smooth boundary.
2Bt2—25 to 41 inches; strong brown (7.5YR 4/6) sandy loam; moderate medium subangular blocky structure; friable; few fine roots; few faint dark brown (7.5YR 3/4) clay films on faces of peds; about 3 percent gravel and 1 percent cobbles; strongly acid; clear wavy boundary.
2Bt3—41 to 51 inches; brown (7.5YR 4/4) loamy sand; weak medium subangular blocky structure; very friable; few faint dark brown (7.5YR 3/4) clay bridges between sand grains; about 10 percent gravel and 1 percent cobbles; strongly acid; gradual wavy boundary.
2C—51 to 61 inches; brown (7.5YR 5/4) loamy sand; massive; very friable; about 10 percent gravel and 1 percent cobbles; strongly acid.

Range in Characteristics

Thickness of the solum: 30 to more than 60 inches
Thickness of the silty mantle: 12 to 40 inches
Content of gravel: 0 to 5 percent in the upper part of the solum; 3 to 30 percent in the lower part of the solum and in the substratum
Content of cobbles: 0 to 10 percent throughout the profile
Content of stones: 0 to 5 percent throughout the profile
Percent of surface covered by stones: 0.1 to 3.0
Note: Unless otherwise stated, depths and thicknesses are measured from the top of the mineral soil.

O horizon:
Hue—10YR, 7.5YR, or N
Value—2 to 3
Chroma—0 to 2
Texture—sapric or hemic material

A horizon:
Hue—10YR, 7.5YR, 5YR, or N
Value—2 to 3
Chroma—0 to 2
Texture—silt loam

E horizon:
Hue—10YR or 7.5YR
Value—4 to 6
Chroma—2 or 3
Texture—silt loam or silt

Bs horizon:
Hue—7.5YR or 5YR
Value—3 or 4
Chroma—4
Texture—silt loam

E´ part of E/B horizon:
Hue—10YR or 7.5YR
Value—5 or 6
Chroma—3
Texture—silt or silt loam

Bt horizon and Bt part of E/B horizon:
Hue—7.5YR or 5YR
Value—4 or 5
Chroma—4 or 6
Texture—silt loam

2Bt horizon:
Hue—7.5YR or 5YR
Value—4 or 5
Chroma—4 or 6
Texture—loamy sand, sandy loam, fine sandy loam, loam, or the gravelly analogs of these textures

2C horizon:
Hue—7.5YR or 5YR
Value—4 or 5
Chroma—4 or 6
Texture—sandy loam, loamy sand, or the gravelly analogs of these textures

Goodwit Series

Depth class: Very deep
Drainage class: Moderately well drained
Permeability: Moderate
Landform: Drumlins and moraines
Parent material: Silty deposits underlain by sandy or loamy glacial till or glacial mudflow sediment
Slope range: 1 to 6 percent

Taxonomic classification: Coarse-loamy, mixed, frigid Oxyaquic Haplorthods

Typical Pedon

Goodwit silt loam, in an area of Wabeno-Goodwit silt loams, 1 to 6 percent slopes, very stony, approximately 450 feet east and 400 feet north of the southwest corner of sec. 10, T. 35 N., R. 16 E.

A—0 to 3 inches; black (10YR 2/1) silt loam, dark gray (10YR 4/1) dry; moderate fine granular structure; friable; many very fine and fine, common medium, and few coarse roots; about 2 percent gravel; moderately acid; abrupt wavy boundary.
E—3 to 5 inches; brown (7.5YR 4/2) silt loam, pinkish gray (7.5YR 6/2) dry; weak thin platy structure parting to weak very fine subangular blocky; friable; many very fine and fine roots and few medium and coarse roots; about 2 percent gravel; strongly acid; abrupt broken boundary.
Bs1—5 to 10 inches; brown (7.5YR 4/4) silt loam; moderate fine and medium subangular blocky structure; friable; many very fine and fine roots and few medium roots; about 2 percent gravel; strongly acid; gradual wavy boundary.
Bs2—10 to 19 inches; brown (7.5YR 5/4) silt loam; moderate medium subangular blocky structure; friable; common very fine and fine roots; about 2 percent gravel; strongly acid; clear wavy boundary.
E/B—19 to 24 inches; 80 percent brown (7.5YR 5/3) silt loam (E´), pink (7.5YR 7/3) dry; weak medium subangular blocky structure; friable; tonguing into and surrounding remnants of brown (7.5YR 4/4) silt loam (Bt); moderate medium subangular

blocky structure; friable; few fine and very fine roots; few faint dark brown (7.5YR 3/4) clay films on faces of peds; about 2 percent gravel; strongly acid; clear wavy boundary.

2B/E—24 to 32 inches; 85 percent brown (7.5YR 4/4) loam (2Bt); moderate medium subangular blocky structure; friable; few faint dark brown (7.5YR 3/4) clay films on faces of peds; penetrated by tongues of brown (7.5YR 5/3) loam (2E´), pink (7.5YR 7/3) dry; weak medium subangular blocky structure; friable; few very fine and fine roots; few fine distinct strong brown (7.5YR 4/6) masses of iron accumulation; about 3 percent gravel and 1 percent cobbles; strongly acid; clear wavy boundary.

2Bt1—32 to 38 inches; brown (7.5YR 4/4) sandy loam; moderate medium subangular blocky structure; friable; few fine roots; common faint dark brown (7.5YR 3/4) clay films on faces of peds; common fine distinct strong brown (7.5YR 4/6) masses of iron accumulation; about 7 percent gravel and 2 percent cobbles; strongly acid; gradual wavy boundary.

2Bt2—38 to 45 inches; brown (7.5YR 4/4) sandy loam; weak medium subangular blocky structure; friable; few fine roots; few faint dark brown (7.5YR 3/4) clay films on faces of peds; common fine distinct strong brown (7.5YR 4/6) masses of iron accumulation; about 9 percent gravel and 4 percent cobbles; strongly acid; gradual wavy boundary.

2C—45 to 60 inches; brown (7.5YR 5/4) gravelly loamy sand; massive; very friable; common fine distinct strong brown (7.5YR 4/6) masses of iron accumulation; about 12 percent gravel and 4 percent cobbles; moderately acid.

Range in Characteristics

Thickness of the solum: 30 to more than 60 inches
Thickness of the silty mantle: 12 to 40 inches
Content of gravel: 0 to 5 percent in the upper part of the solum; 3 to 30 percent in the lower part of the solum and in the substratum
Content of cobbles: 0 to 10 percent throughout the profile
Content of stones: 0 to 5 percent throughout the profile
Percent of surface covered by stones: 0.1 to 3.0

O horizon (if it occurs):
Hue—10YR, 7.5YR, or N
Value—2 to 3
Chroma—0 to 2
Texture—sapric or hemic material

A horizon:
Hue—10YR, 7.5YR, 5YR, or N
Value—2 to 3
Chroma—0 to 2
Texture—silt loam

E horizon:
Hue—10YR or 7.5YR
Value—4 to 6
Chroma—2 or 3
Texture—silt or silt loam

Bs horizon:
Hue—7.5YR or 5YR
Value—3 or 4
Chroma—4
Texture—silt loam

E´ part of E/B horizon:
Hue—10YR or 7.5YR
Value—5 or 6
Chroma—3
Texture—silt or silt loam

Bt part of E/B horizon:
Hue—7.5YR or 5YR
Value—4 or 5
Chroma—4 or 6
Texture—silt loam

2Bt horizon and 2Bt part of 2B/E horizon:
Hue—10YR, 7.5YR, or 5YR
Value—4 or 5
Chroma—4 or 6
Texture—loam, sandy loam, fine sandy loam, loamy sand, or the gravelly analogs of these textures

2E´ part of 2B/E horizon:
Hue—10YR or 7.5YR
Value—4 to 6
Chroma—3
Texture—loam, fine sandy loam, sandy loam, loamy sand, or the gravelly analogs of these textures

2C horizon:
Hue—10YR, 7.5YR, 5YR
Value—4 or 5
Chroma—4 or 6
Texture—sandy loam, loamy sand, or the gravelly analogs of these textures

Kinross Series

Depth class: Very deep
Drainage class: Poorly drained
Permeability: Rapid
Landform: Outwash plains and stream terraces

Parent material: Primarily sandy glacial outwash
Slope range: 0 to 2 percent

Taxonomic classification: Sandy, mixed, frigid Typic Endoaquods

Typical Pedon

Kinross muck, 0 to 2 percent slopes, approximately 200 feet east and 2,000 feet north of the southwest corner of sec. 33, T. 35 N., R. 12 E.

Oa—0 to 6 inches; muck, black (10YR 2/1) broken face, very dark brown (10YR 2/2) rubbed; about 40 percent fiber, 10 percent rubbed; weak fine subangular blocky structure; very friable; many very fine, fine, and medium roots; fibers are primarily herbaceous; about 10 percent mineral material; very strongly acid (pH 5.0 in water 1:1); clear wavy boundary.
E1—6 to 16 inches; dark gray (10YR 4/1) loamy sand, light brownish gray (10YR 6/2) dry; weak fine subangular blocky structure; very friable; common very fine and fine roots; few fine distinct dark yellowish brown (10YR 4/4) masses of iron accumulation; strongly acid; clear wavy boundary.
E2—16 to 19 inches; dark gray (10YR 4/1) loamy sand, gray (10YR 6/1) dry; weak fine subangular blocky structure; very friable; few very fine and fine roots; common medium distinct dark yellowish brown (10YR 4/4) masses of iron accumulation; strongly acid; clear wavy boundary.
Bhs—19 to 28 inches; dark reddish brown (5YR 3/2) sand; weak fine subangular blocky structure; very friable; few medium prominent brown (7.5YR 4/4) masses of iron accumulation; strongly acid; clear wavy boundary.
Bs—28 to 39 inches; dark brown (7.5YR 3/4) sand; weak medium subangular blocky structure; very friable; common medium faint brown (7.5YR 4/4) masses of iron accumulation; moderately acid; gradual wavy boundary.
BC—39 to 43 inches; yellowish brown (10YR 5/4) sand; weak medium subangular blocky structure; very friable; common medium distinct dark yellowish brown (10YR 4/6) masses of iron accumulation; moderately acid; gradual wavy boundary.
C—43 to 60 inches; light yellowish brown (10YR 6/4) sand; single grain; loose; common medium prominent brown (7.5YR 4/4) masses of iron accumulation; slightly acid.

Range in Characteristics

Thickness of the solum: 20 to 50 inches
Content of gravel: 0 to 5 percent throughout the profile

Oa horizon:
Hue—10YR, 7.5YR, 5YR, or N
Value—2 to 3
Chroma—0 to 2
Texture—muck

A horizon (if it occurs):
Hue—10YR, 7.5YR, or 5YR
Value—2 to 3
Chroma—1 or 2
Texture—loamy sand or sand

E horizon:
Hue—10YR or 7.5YR
Value—4 to 6
Chroma—1 or 2
Texture—loamy sand or sand

Bhs horizon:
Hue—7.5YR or 5YR
Value—2 to 3
Chroma—2 or 3
Texture—loamy sand or sand

Bs horizon:
Hue—7.5YR or 5YR
Value—3 or 4
Chroma—4
Texture—loamy sand or sand

C horizon:
Hue—10YR or 7.5YR
Value—4 to 6
Chroma—3 to 6
Texture—sand

Laona Series

Depth class: Moderately deep to a fragipan
Drainage class: Well drained
Permeability: Moderate in the upper part, slow in the fragipan, and moderate or moderately rapid in the substratum
Landform: Drumlins and moraines
Parent material: Primarily loamy deposits underlain by sandy or loamy glacial till or glacial mudflow sediment
Slope range: 6 to 35 percent

Taxonomic classification: Coarse-loamy, mixed, frigid Alfic Fragiorthods

Typical Pedon

Laona sandy loam, in an area of Laona-Sarona sandy loams, 6 to 15 percent slopes, very stony, approximately 2,400 feet east and 500 feet south of the northwest corner of sec. 1, T. 35 N., R. 16 E.

Oa—0 to 2 inches; muck (sapric material, which is a mat of partially decomposed forest litter), black (10YR 2/1) broken face and rubbed; about 35 percent fiber, 10 percent rubbed; weak fine granular structure; very friable; many very fine and fine roots and few medium roots; extremely acid (pH 4.3 in water 1:1); abrupt wavy boundary.

E—2 to 3 inches; brown (7.5YR 4/2) sandy loam, pinkish gray (7.5YR 7/2) dry; weak medium subangular blocky structure; friable; many very fine and fine roots and common medium and coarse roots; about 4 percent gravel; strongly acid; abrupt broken boundary.

Bs1—3 to 7 inches; dark brown (7.5YR 3/4) sandy loam; moderate medium subangular blocky structure; friable; many very fine and fine roots and common medium and coarse roots; about 3 percent gravel; strongly acid; clear wavy boundary.

Bs2—7 to 21 inches; brown (7.5YR 4/4) sandy loam; moderate medium subangular blocky structure; friable; common very fine and fine roots and few medium and coarse roots; about 4 percent gravel; very strongly acid; clear wavy boundary.

E/Bx—21 to 35 inches; 60 percent brown (7.5YR 5/3) gravelly sandy loam (E´), pink (7.5YR 7/3) dry; weak medium subangular blocky structure; firm; brittle; tonguing into and surrounding remnants of brown (7.5YR 4/4) gravelly sandy loam (Bt); moderate medium subangular blocky structure; firm; brittle; about 11 percent gravel and 5 percent cobbles; moderately acid; gradual wavy boundary.

B/Ex—35 to 51 inches; 60 percent brown (7.5YR 4/4) gravelly sandy loam (Bt); moderate medium subangular blocky structure; firm; brittle; common faint brown (7.5YR 4/3) clay films on faces of peds; penetrated by tongues of brown (7.5YR 5/3) gravelly sandy loam (E´), pink (7.5YR 7/3) dry; weak medium subangular blocky structure; firm; brittle; common vesicular pores; about 14 percent gravel and 5 percent cobbles; moderately acid; clear wavy boundary.

Btx—51 to 70 inches; brown (7.5YR 4/4) gravelly sandy loam; moderate medium and coarse subangular blocky structure; firm; brittle; tends to part along horizontal cleavage planes inherited from the parent material; common vesicular pores; few faint brown (7.5YR 4/3) clay films on faces of peds; about 12 percent gravel and 5 percent cobbles; slightly acid; gradual wavy boundary.

C—70 to 80 inches; dark yellowish brown (10YR 4/4) gravelly sandy loam; massive; friable; about 12 percent gravel and 5 percent cobbles; slightly acid.

Range in Characteristics

Thickness of the solum: 40 to more than 60 inches

Depth to the fragipan: 20 to 40 inches

Content of gravel: 0 to 10 percent in the upper part of the solum; 5 to 25 percent in the lower part of the solum and in the substratum

Content of cobbles: 0 to 10 percent in the upper part of the solum; 0 to 20 percent in the lower part of the solum and in the substratum

Content of stones: 0 to 5 percent throughout the profile

Percent of surface covered by stones: 0.1 to 3.0

Note: Unless otherwise stated, depths and thicknesses are measured from the top of the mineral soil.

O horizon:
- Hue—10YR, 7.5YR, or N
- Value—2 to 3
- Chroma—0 to 2
- Texture—sapric or hemic material

A horizon (if it occurs):
- Hue—10YR, 7.5YR, or 5YR
- Value—2 to 3
- Chroma—1 or 2
- Texture—sandy loam

E horizon:
- Hue—10YR, 7.5YR, or 5YR
- Value—4 to 7
- Chroma—2 or 3
- Texture—sandy loam

Bs horizon:
- Hue—7.5YR or 5YR
- Value—3 or 4
- Chroma—4
- Texture—sandy loam or fine sandy loam

E´ part of E/Bx and B/Ex horizons:
- Hue—10YR or 7.5YR
- Value—4 to 7
- Chroma—2 or 3
- Texture—sandy loam, loamy sand, or the gravelly or cobbly analogs of these textures

Bt part of E/Bx, B/Ex, and Btx horizons:
- Hue—10YR or 7.5YR
- Value—3 or 4
- Chroma—4 or 6
- Texture—sandy loam, loamy sand, or the gravelly or cobbly analogs of these textures

C horizon:
- Hue—10YR or 7.5YR

Value—3 or 4
Chroma—4 or 6
Texture—sandy loam, loamy sand, or the gravelly or cobbly analogs of these textures

Loxley Series

Depth class: Very deep
Drainage class: Very poorly drained
Permeability: Moderately slow to moderately rapid
Landform: Outwash plains, glacial lake plains, and moraines
Parent material: Sphagnum moss and herbaceous organic material more than 51 inches thick
Slope range: 0 to 1 percent

Taxonomic classification: Dysic Typic Borosaprists

Typical Pedon

Loxley peat, in an area of Loxley, Beseman, and Dawson peats, 0 to 1 percent slopes, approximately 100 feet west and 1,825 feet south of the northeast corner of sec. 26, T. 39 N., R. 13 E.

Oi—0 to 12 inches; peat, dark yellowish brown (10YR 3/4) broken face and rubbed; about 80 percent fiber, 50 percent rubbed; moderate medium subangular blocky structure; very friable; many fine roots; fibers are primarily sphagnum moss; extremely acid (pH 4.0 in water 1:1); clear wavy boundary.
Oa1—12 to 34 inches; muck, black (5YR 2.5/1) broken face, dark reddish brown (5YR 2.5/2) rubbed; about 56 percent fiber, 8 percent rubbed; moderate coarse subangular blocky structure; friable; few fine roots; fibers are primarily herbaceous; extremely acid (pH 4.0 in water 1:1); gradual wavy boundary.
Oa2—34 to 41 inches; muck, black (5YR 2.5/1) broken face and rubbed; about 40 percent fiber, 6 percent rubbed; weak medium subangular blocky structure; friable; few fine roots; fibers are primarily herbaceous; extremely acid (pH 4.3 in water 1:1); gradual wavy boundary.
Oa3—41 to 60 inches; muck, black (5YR 2.5/1) broken face and rubbed; about 48 percent fiber, 8 percent rubbed; massive; friable; fibers are primarily herbaceous; extremely acid (pH 4.3 in water 1:1).

Range in Characteristics

Thickness of organic material: More than 51 inches
Kind of organic material: Upper layers—peat; lower layers—dominantly muck (thin layers of mucky peat or peat in some pedons)
Content of woody fragments: 0 to 10 percent

Oi horizon:
Hue—10YR
Value—3 or 4
Chroma—2 to 4
Texture—peat

Oa horizon:
Hue—10YR, 7.5YR, or 5YR
Value—2 to 3
Chroma—1 to 3
Texture—muck

Lupton Series

Depth class: Very deep
Drainage class: Very poorly drained
Permeability: Moderately slow to moderately rapid
Landform: Outwash plains, glacial lake plains, and moraines
Parent material: Herbaceous and woody organic material more than 51 inches thick
Slope range: 0 to 1 percent

Taxonomic classification: Euic Typic Borosaprists

Typical Pedon

Lupton muck, in an area of Lupton, Cathro, and Markey mucks, 0 to 1 percent slopes, approximately 2,000 feet west and 650 feet north of the southeast corner of sec. 5, T. 38 N., R. 13 E.

Oa1—0 to 10 inches; muck, black (10YR 2/1) broken face and rubbed; about 66 percent fiber, 15 percent rubbed; moderate medium subangular blocky structure; very friable; many fine roots; fibers are primarily herbaceous; about 10 percent woody fragments; moderately acid (pH 6.0 in water 1:1); gradual wavy boundary.
Oa2—10 to 25 inches; muck, black (10YR 2/1) broken face and rubbed; about 60 percent fiber, 15 percent rubbed; weak medium subangular blocky structure; very friable; few fine roots; fibers are primarily herbaceous; about 10 percent woody fragments; moderately acid (pH 6.0 in water 1:1); gradual wavy boundary.
Oa3—25 to 46 inches; muck, black (10YR 2/1) broken face and rubbed; about 64 percent fiber, 15 percent rubbed; massive; very friable; fibers are primarily herbaceous; about 10 percent woody fragments; moderately acid (pH 6.0 in water 1:1); gradual wavy boundary.
Oa4—46 to 60 inches; muck, black (10YR 2/1) broken face and rubbed; about 72 percent fiber, 13 percent rubbed; massive; very friable; fibers are

primarily herbaceous; slightly acid (pH 6.3 in water 1:1).

Range in Characteristics

Thickness of organic material: More than 51 inches
Kind of organic material: Dominantly muck; thin layers of mucky peat or peat in some pedons
Content of woody fragments: 5 to 30 percent

Oa horizon:
Hue—10YR, 7.5YR, 5YR, or N
Value—2 to 3
Chroma—0 to 3
Texture—muck

Manitowish Series

Depth class: Very deep
Drainage class: Moderately well drained
Permeability: Moderate or moderately rapid in the upper part and rapid or very rapid in the lower part
Landform: Outwash plains and stream terraces
Parent material: Loamy deposits underlain by sandy and gravelly glacial outwash
Slope range: 0 to 3 percent

Taxonomic classification: Sandy, mixed, frigid Oxyaquic Haplorthods

Typical Pedon

Manitowish sandy loam, 0 to 3 percent slopes, approximately 1,700 feet west and 1,800 feet south of the northeast corner of sec. 33, T. 37 N., R. 14 E.

A—0 to 2 inches; black (10YR 2/1) sandy loam, dark gray (10YR 4/1) dry; weak fine granular structure; very friable; common very fine and fine roots and few medium and coarse roots; strongly acid; clear wavy boundary.
E—2 to 4 inches; brown (7.5YR 5/2) sandy loam, pinkish gray (5YR 7/2) dry; weak fine subangular blocky structure parting to weak fine granular; very friable; common very fine and fine roots and few medium and coarse roots; strongly acid; clear wavy boundary.
Bs1—4 to 10 inches; brown (7.5YR 4/4) sandy loam; weak fine subangular blocky structure; very friable; few very fine, fine, and medium roots; moderately acid; gradual wavy boundary.
Bs2—10 to 16 inches; brown (7.5YR 4/4) sandy loam; weak fine subangular blocky structure; very friable; few very fine, fine, and medium roots; about 5 percent gravel; moderately acid; clear wavy boundary.
2BC—16 to 22 inches; strong brown (7.5YR 4/6) loamy sand; weak fine subangular blocky structure; very friable; few very fine and fine roots; about 13 percent gravel; moderately acid; gradual wavy boundary.
2C1—22 to 32 inches; brown (7.5YR 5/4), stratified sand and gravelly coarse sand; single grain; loose; about 20 percent gravel; slightly acid; gradual wavy boundary.
2C2—32 to 60 inches; brown (7.5YR 5/4), stratified sand and gravelly coarse sand; single grain; loose; few fine prominent yellowish brown (10YR 5/6) masses of iron accumulation; about 25 percent gravel; slightly acid.

Range in Characteristics

Thickness of the solum: 18 to 36 inches
Thickness of the loamy mantle: 10 to 20 inches
Content of gravel: 0 to 35 percent in the solum; 15 to 35 percent in the substratum
Content of cobbles: 0 to 5 percent throughout the profile

O horizon (if it occurs):
Hue—10YR, 7.5YR, 5YR, or N
Value—2 to 3
Chroma—0 to 2
Texture—sapric or hemic material

A horizon:
Hue—10YR, 7.5YR, or 5YR
Value—2 to 3
Chroma—1 or 2
Texture—sandy loam

E horizon:
Hue—7.5YR or 5YR
Value—4 or 5
Chroma—2
Texture—sandy loam

Bs horizon:
Hue—7.5YR or 5YR
Value—3 or 4
Chroma—4
Texture—sandy loam or gravelly sandy loam

2C horizon:
Hue—10YR or 7.5YR
Value—4 or 5
Chroma—4 or 6
Texture—gravelly sand, gravelly coarse sand, stratified sand and gravelly sand, or stratified sand and gravelly coarse sand

Markey Series

Depth class: Very deep
Drainage class: Very poorly drained
Permeability: Moderately slow to moderately rapid in the organic material and very rapid in the substratum
Landform: Outwash plains, glacial lake plains, and moraines
Parent material: Herbaceous organic material 16 to 51 inches thick over sandy or sandy and gravelly deposits
Slope range: 0 to 1 percent

Taxonomic classification: Sandy or sandy-skeletal, mixed, euic Terric Borosaprists

Typical Pedon

Markey muck (fig. 21), in an area of Lupton, Cathro, and Markey mucks, 0 to 1 percent slopes, approximately 150 feet south and 200 feet east of the northwest corner of sec. 12, T. 38 N., R. 17 E., in Florence County, Wisconsin:

Oa—0 to 17 inches; muck, black (N 2.5/0) broken face and rubbed; about 35 percent fiber, 5 percent rubbed; massive; very friable; fibers are primarily herbaceous; about 5 percent sand; neutral (pH 6.8 in water 1:1); clear wavy boundary.
Oe—17 to 21 inches; mucky peat, black (N 2.5/0) broken face and rubbed; about 50 percent fiber, 15 percent rubbed; massive; very friable; fibers are primarily herbaceous; about 10 percent sand; neutral (pH 6.8 in water 1:1); clear smooth boundary.
O´a—21 to 36 inches; muck, black (N 2.5/0) broken face and rubbed; about 30 percent fiber, 8 percent rubbed; massive; very friable; fibers are primarily herbaceous; about 10 percent sand; neutral; (pH 6.9 in water 1:1); abrupt smooth boundary.
C—36 to 60 inches; grayish brown (10YR 5/2) sand; single grain; loose; few thin strata and pockets of loamy sand; about 3 percent gravel; neutral.

Range in Characteristics

Thickness of organic material: 16 to 51 inches
Kind of organic material: Dominantly muck; thin layers of mucky peat or peat in most pedons
Content of woody fragments: 0 to 10 percent

Oa horizon:
Hue—10YR, 7.5YR, 5YR, or N
Value—2 to 3
Chroma—0 to 3
Texture—muck

C horizon:
Hue—2.5Y, 10YR, 7.5YR, or N
Value—4 to 6
Chroma—0 to 4
Texture—sand, fine sand, loamy fine sand, loamy sand, gravelly loamy sand, or gravelly sand

Metonga Series

Depth class: Moderately deep to hard igneous or metamorphic bedrock
Drainage class: Well drained
Permeability: Moderate in the solum and very slow to rapid in the underlying material
Landform: Moraines
Parent material: Loamy deposits over loamy glacial till underlain by igneous or metamorphic bedrock
Slope range: 4 to 60 percent

Taxonomic classification: Coarse-loamy, mixed, frigid Entic Haplorthods

Typical Pedon

Metonga very fine sandy loam, in an area of Metonga-Rock outcrop complex, 4 to 60 percent slopes, very stony, approximately 1,600 feet west and 500 feet north of the southeast corner of sec. 35, T. 34 N., R. 16 E.

A—0 to 3 inches; black (10YR 2/1) very fine sandy loam, dark gray (10YR 4/1) dry; weak fine granular structure; very friable; many fine and common medium roots; about 1 percent gravel; moderately acid; abrupt smooth boundary.
E—3 to 4 inches; brown (7.5YR 4/2) very fine sandy loam, pinkish gray (7.5YR 6/2) dry; weak fine subangular blocky structure; very friable; many fine and common medium roots; about 1 percent gravel; strongly acid; abrupt broken boundary.
Bs1—4 to 7 inches; dark brown (7.5YR 3/4) very fine sandy loam; weak fine subangular blocky structure; very friable; many fine and common medium roots; about 1 percent gravel; very strongly acid; clear wavy boundary.
Bs2—7 to 23 inches; brown (7.5YR 4/4) very fine sandy loam; weak medium subangular blocky structure; very friable; common fine and few medium roots; about 2 percent gravel; very strongly acid; abrupt wavy boundary.
Bs3—23 to 25 inches; brown (7.5YR 4/4) very fine sandy loam; weak fine subangular blocky structure; friable; common fine and few medium roots; about 2 percent gravel; very strongly acid; abrupt wavy boundary.

2Bw—25 to 28 inches; reddish brown (5YR 4/4) sandy loam; weak medium subangular blocky structure; friable; few fine roots; about 8 percent gravel; moderately acid; abrupt irregular boundary.
3R—28 inches; granite bedrock with some fractures more than 4 inches apart.

Range in Characteristics

Depth to bedrock: 20 to 40 inches
Content of gravel: 0 to 5 percent in the upper layers; 5 to 35 percent in the till
Content of cobbles: 0 to 5 percent in the upper layers; 0 to 10 percent in the till
Content of stones: 0 to 5 percent throughout the profile
Percent of surface covered by stones: 0.1 to 3.0

O horizon (if it occurs):
Hue—10YR, 7.5YR, 5YR, or N
Value—2 to 3
Chroma—0 to 2
Texture—sapric or hemic material

A horizon:
Hue—10YR, 7.5YR, or 5YR
Value—2 to 3
Chroma—1 or 2
Texture—very fine sandy loam

E horizon:
Hue—7.5YR or 5YR
Value—4 to 6
Chroma—2 or 3
Texture—very fine sandy loam

Bs horizon:
Hue—7.5YR or 5YR
Value—3 or 4
Chroma—4
Texture—very fine sandy loam

2Bw horizon:
Hue—10YR, 7.5YR, or 5YR
Value—3 to 6
Chroma—3 or 4
Texture—sandy loam or gravelly sandy loam

3R horizon:
Kind of bedrock—metamorphic or igneous

Minocqua Series

Depth class: Very deep
Drainage class: Poorly drained
Permeability: Moderate in the upper part and rapid or very rapid in the lower part
Landform: Outwash plains and stream terraces
Parent material: Primarily silty and loamy deposits underlain by sandy or sandy and gravelly glacial outwash
Slope range: 0 to 2 percent

Taxonomic classification: Coarse-loamy over sandy or sandy-skeletal, mixed, nonacid, frigid Typic Endoaquepts

Typical Pedon

Minocqua muck, 0 to 2 percent slopes, approximately 320 feet east and 2,075 feet north of the southwest corner of sec. 1, T. 36 N., R. 13 E.

Oa—0 to 4 inches; muck, black (N 2.5/0) broken face, dark brown (7.5YR 3/2) rubbed; about 60 percent fiber, 12 percent rubbed; weak fine granular structure; very friable; many fine and common medium roots; fibers are primarily herbaceous; about 15 percent mineral material; moderately acid; abrupt smooth boundary.
Eg1—4 to 8 inches; dark gray (10YR 4/1) silt loam, light gray (10YR 7/1) dry; weak thin platy structure; friable; common fine roots; common medium distinct dark yellowish brown (10YR 4/4) and few fine prominent strong brown (7.5YR 4/6) masses of iron accumulation; about 8 percent gravel; strongly acid; abrupt wavy boundary.
Eg2—8 to 15 inches; grayish brown (10YR 5/2) silt loam; moderate thin platy structure; friable; few fine roots; many medium prominent brown (7.5YR 4/4) and few fine prominent red (2.5YR 4/6) masses of iron accumulation; about 3 percent gravel; moderately acid; clear wavy boundary.
2Bg—15 to 28 inches; dark grayish brown (10YR 4/2) loam; weak medium subangular blocky structure parting to weak thin platy; friable; common medium prominent strong brown (7.5YR 4/6) and many medium prominent brown (7.5YR 4/4) masses of iron accumulation; about 5 percent gravel; moderately acid; abrupt wavy boundary.
3C1—28 to 33 inches; brown (7.5YR 4/4) sand; single grain; loose; common coarse distinct strong brown (7.5YR 4/6) masses of iron accumulation; about 5 percent gravel; slightly acid; abrupt wavy boundary.
3C2—33 to 38 inches; brown (7.5YR 4/4) gravelly sand; single grain; loose; common coarse distinct strong brown (7.5YR 4/6) masses of iron accumulation; about 30 percent gravel; slightly acid; gradual wavy boundary.
3C3—38 to 60 inches; brown (10YR 5/3) very gravelly sand; single grain; loose; about 40 percent gravel; slightly acid.



Figure 21.—Profile of a Markey soil. The herbaceous organic material is underlain by lighter colored sandy deposits at a depth of about 36 inches. Depth is marked in feet.



Figure 22.—Profile of a Padus soil. The dark surface layer is underlain by a lighter colored subsurface layer. Sandy and gravelly glacial outwash is at a depth of about 30 inches. Depth is marked in feet.

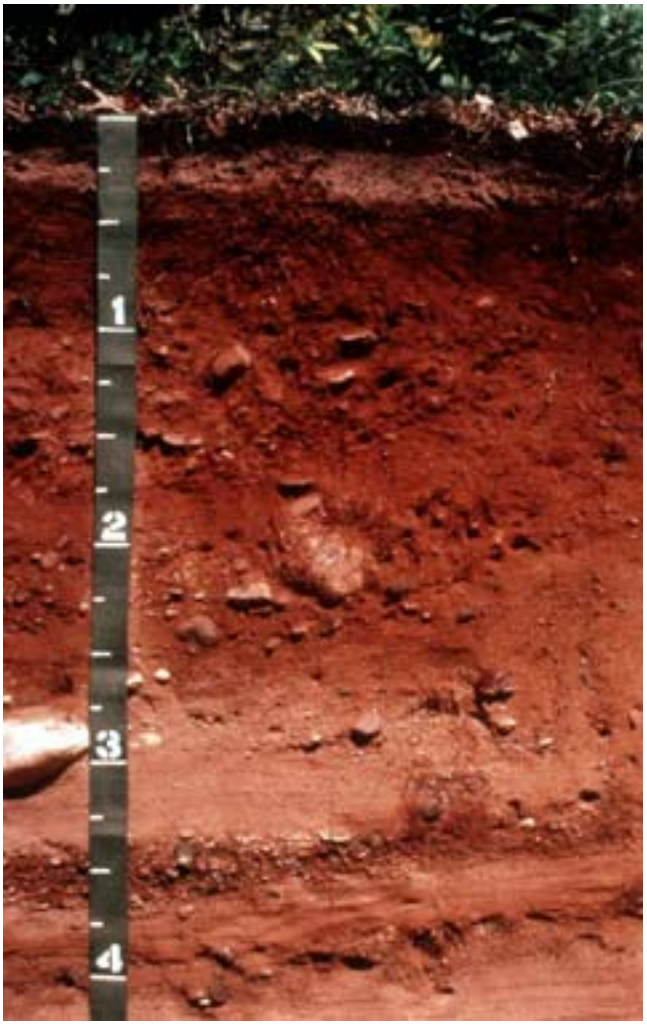


Figure 23.—Profile of a Pence soil. The thin, light-colored subsurface layer is underlain by a subsoil that has a high content of organic matter and has iron and aluminum compounds. Depth is marked in feet.



Figure 24.—Profile of a Sarona soil. The top arrow indicates a leached subsurface layer. The substratum, which has undergone relatively little change since it was deposited, begins at a depth of about 48 inches and is indicated by the lower arrow. Depth is marked in feet.



Figure 25.—Profile of a Tipler soil. The wetness characteristics are apparent in the lower part of the subsoil, where yellowish red mottles occur. Depth is marked in feet.



Figure 26.—Profile of a Vanzile soil. The light-colored layer between the depths of about 12 and 24 inches is an eluvial layer. Below this is a mottled subsoil, which has a higher content of clay than the layer above it. Depth is marked in feet.



Figure 27.—Profile of a Vilas soil. The top arrow indicates the surface layer. The next arrow is at the top of the subsurface layer. The third arrow shows the upper part of the subsoil, and the bottom arrow indicates the lighter colored lower part of the subsoil. Depth is marked in feet.

Range in Characteristics

Thickness of the solum: 20 to 40 inches
Thickness of the loamy or silty mantle: 20 to 40 inches
Content of gravel: 0 to 15 percent in the solum; 3 to 50 percent in the substratum
Content of cobbles: 0 to 5 percent throughout the profile

Oa horizon:
Hue—10YR, 7.5YR, or N
Value—2 to 3
Chroma—0 to 2
Texture—muck

A horizon (if it occurs):
Hue—10YR, 7.5YR, or 5YR
Value—2 to 3
Chroma—1 or 2
Texture—silt loam, loam, sandy loam, fine sandy loam, or the mucky analogs of these textures

Eg horizon:
Hue—10YR or 7.5YR
Value—4 to 6
Chroma—1 or 2
Texture—silt loam, loam, sandy loam, or fine sandy loam

2Bg horizon:
Hue—2.5Y, 10YR, or 7.5YR
Value—4 to 6
Chroma—1 or 2
Texture—loam, sandy loam, or fine sandy loam

3C horizon:
Hue—10YR or 7.5YR
Value—4 or 5
Chroma—2 to 4
Texture—sand, coarse sand, or the gravelly or very gravelly analogs of these textures

Mudlake Series

Depth class: Very deep
Drainage class: Somewhat poorly drained
Permeability: Moderate in the upper part and moderate or moderately rapid in the lower part
Landform: Drumlins and moraines
Parent material: Silty deposits underlain by sandy or loamy glacial till or glacial mudflow sediment
Slope range: 1 to 6 percent

Taxonomic classification: Coarse-loamy, mixed, frigid Alfic Epiaquods

Typical Pedon

Mudlake silt loam, 1 to 6 percent slopes, very stony, approximately 2,200 feet west of the southeast corner of sec. 28, T. 36 N., R. 12 E.

A—0 to 5 inches; dark brown (7.5YR 3/2) silt loam, brown (7.5YR 5/2) dry; weak fine granular structure; friable; many very fine and fine roots and common medium and coarse roots; about 2 percent gravel and 1 percent cobbles; very strongly acid; abrupt wavy boundary.

E—5 to 9 inches; brown (7.5YR 5/2) silt loam, pinkish gray (7.5YR 7/2) dry; weak medium and coarse subangular blocky structure; friable; many very fine and fine roots and common medium and coarse roots; few fine prominent strong brown (7.5YR 5/8) masses of iron accumulation; about 7 percent gravel and 1 percent cobbles; very strongly acid; abrupt wavy boundary.

Bs—9 to 16 inches; brown (7.5YR 4/4) silt loam; weak medium subangular blocky structure; friable; common very fine and fine roots and few medium and coarse roots; few fine distinct strong brown (7.5YR 4/6) masses of iron accumulation; about 4 percent gravel and 1 percent cobbles; very strongly acid; clear wavy boundary.

B/E—16 to 29 inches; 70 percent brown (7.5YR 4/4) silt loam (Bt); moderate medium subangular blocky structure; friable; few faint brown (7.5YR 4/3) clay films on faces of peds; penetrated by tongues of brown (7.5YR 5/3) silt loam (E´), pink (7.5YR 7/3) dry; moderate medium subangular blocky structure; friable; common very fine and fine roots and few medium and coarse roots; many medium prominent yellowish red (5YR 5/8 and 4/6) masses of iron accumulation and common medium distinct and faint pinkish gray (7.5YR 6/2) iron depletions; about 3 percent gravel and 1 percent cobbles; strongly acid; clear wavy boundary.

2Bt—29 to 35 inches; brown (7.5YR 4/4) sandy loam; weak medium subangular blocky structure; friable; few very fine and fine roots; few faint brown (7.5YR 4/3) clay films on faces of peds and in pores; few fine distinct strong brown (7.5YR 5/6) masses of iron accumulation and common fine distinct brown (7.5YR 5/2) iron depletions; about 5 percent gravel and 2 percent cobbles; strongly acid; gradual wavy boundary.

2C—35 to 60 inches; brown (7.5YR 4/4) loamy sand; massive; friable; about 5 percent gravel and 2 percent cobbles; strongly acid.

Range in Characteristics

Thickness of the solum: 30 to more than 60 inches
Thickness of the silty mantle: 12 to 40 inches
Content of gravel: 0 to 15 percent in the upper part of the solum; 5 to 35 percent in the lower part of the solum and in the substratum
Content of cobbles: 0 to 15 percent throughout the profile
Content of stones: 0 to 5 percent throughout the profile
Percent of surface covered by stones: 0.1 to 3.0

O horizon (if it occurs):
Hue—10YR, 7.5YR, 5YR, or N
Value—2 to 3
Chroma—0 to 2
Texture—sapric or hemic material

A horizon:
Hue—10YR, 7.5YR, or 5YR
Value—2 to 3
Chroma—1 or 2
Texture—silt loam

E horizon:
Hue—10YR, 7.5YR, or 5YR
Value—4 to 6
Chroma—2 or 3
Texture—silt loam or silt

Bs horizon:
Hue—7.5YR or 5YR
Value—3 or 4
Chroma—4
Texture—silt loam

E´ part of B/E horizon:
Hue—10YR, 7.5YR, or 5YR
Value—5 or 6
Chroma—3
Texture—silt loam or silt

Bt part of B/E horizon:
Hue—7.5YR or 5YR
Value—4 or 5
Chroma—4 or 6
Texture—silt loam

2Bt horizon:
Hue—10YR, 7.5YR, or 5YR
Value—3 to 6
Chroma—4 or 6
Texture—loam, fine sandy loam, sandy loam, loamy sand, or the gravelly or cobbly analogs of these textures

2C horizon:
Hue—10YR, 7.5YR, or 5YR
Value—3 to 6
Chroma—4 or 6
Texture—sandy loam, loamy sand, or the gravelly or cobbly analogs of these textures

Padus Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate in the solum and rapid or very rapid in the substratum
Landform: Outwash plains, stream terraces, eskers, kames, drumlins, and moraines
Parent material: Silty or loamy deposits underlain by sandy or sandy and gravelly glacial outwash
Slope range: 0 to 35 percent

Taxonomic classification: Coarse-loamy, mixed, frigid Alfic Haplorthods

Typical Pedon

Padus sandy loam, 0 to 6 percent slopes (fig. 22), approximately 1,000 feet east and 50 feet north of the southwest corner of sec. 15, T. 38 N., R. 12 E.

A—0 to 2 inches; dark brown (7.5YR 3/2) sandy loam, brown (7.5YR 5/2) dry; weak fine granular structure; friable; many fine and common medium roots; about 2 percent gravel; very strongly acid; abrupt smooth boundary.
E—2 to 4 inches; reddish gray (5YR 5/2) sandy loam, pinkish gray (5YR 6/2) dry; weak fine subangular blocky structure; very friable; common fine and medium roots; about 2 percent gravel; very strongly acid; abrupt smooth boundary.
Bs1—4 to 10 inches; dark brown (7.5YR 3/4) sandy loam; weak fine subangular blocky structure; very friable; common fine and medium roots; about 5 percent gravel; very strongly acid; clear wavy boundary.
Bs2—10 to 16 inches; brown (7.5YR 4/4) sandy loam; weak medium subangular blocky structure; friable; common fine and few medium roots; about 8 percent gravel; very strongly acid; clear wavy boundary.
E/B—16 to 20 inches; 70 percent brown (10YR 5/3) sandy loam (E´), very pale brown (10YR 7/3) dry; weak medium subangular blocky structure; friable; tonguing into and surrounding remnants of brown (7.5YR 4/4) sandy loam (Bt); weak medium subangular blocky structure; friable; common fine and few medium roots; few faint dark brown (7.5YR 3/4) clay films on faces of peds; about 8 percent gravel; very strongly acid; clear wavy boundary.

Bt—20 to 25 inches; brown (7.5YR 4/4) sandy loam; moderate medium subangular blocky structure; friable; few fine and medium roots; few faint dark brown (7.5YR 3/4) clay films on faces of peds; about 8 percent gravel; very strongly acid; abrupt wavy boundary.
2C—25 to 60 inches; strong brown (7.5YR 5/6), stratified sand and gravelly sand; single grain; loose; about 25 percent gravel and 3 percent cobbles; strongly acid.

Range in Characteristics

Thickness of the solum: 24 to 40 inches
Thickness of the loamy or silty mantle: 24 to 40 inches
Content of gravel: 0 to 15 percent in the upper part of the solum; 3 to 50 percent in the lower part of the solum and in the substratum
Content of cobbles: 0 to 5 percent throughout the profile

O horizon (if it occurs):
Hue—10YR, 7.5YR, or N
Value—2 to 3
Chroma—0 to 2
Texture—sapric or hemic material

A horizon:
Hue—10YR, 7.5YR, or 5YR
Value—2 to 3
Chroma—1 or 2
Texture—sandy loam or silt loam

E horizon:
Hue—10YR, 7.5YR, or 5YR
Value—4 or 5
Chroma—2 or 3
Texture—sandy loam or silt loam

Bs horizon:
Hue—7.5YR or 5YR
Value—3 or 4
Chroma—4
Texture—sandy loam or silt loam

E´ part of E/B horizon:
Hue—10YR, 7.5YR, or 5YR
Value—4 or 5
Chroma—3
Texture—loam, fine sandy loam, or sandy loam

Bt horizon and Bt part of E/B horizon:
Hue—10YR, 7.5YR, or 5YR
Value—4 or 5
Chroma—4 or 6
Texture—loam, fine sandy loam, or sandy loam

2C horizon:
Hue—10YR, 7.5YR, or 5YR
Value—4 to 6
Chroma—3 to 6
Texture—stratified sand, coarse sand, or the gravelly or very gravelly analogs of these textures

Padwood Series

Depth class: Very deep
Drainage class: Moderately well drained
Permeability: Moderate in the loamy mantle, rapid or very rapid in the sandy outwash, and moderately slow in the lacustrine deposits
Landform: Outwash plains, stream terraces, and glacial lake plains
Parent material: Primarily loamy deposits over sandy or sandy and gravelly glacial outwash underlain by stratified lacustrine deposits
Slope range: 0 to 6 percent

Taxonomic classification: Coarse-loamy, mixed, frigid Oxyaquic Haplorthods

Typical Pedon

Padwood sandy loam, 0 to 6 percent slopes, approximately 1,600 feet west and 2,200 feet south of the northeast corner of sec. 10, T. 37 N., R. 14 E.

Oa—0 to 1 inch; muck (sapric material, which is a mat of partially decomposed forest litter), black (10YR 2/1) broken face and rubbed; about 20 percent fiber, 10 percent rubbed; weak fine granular structure; very friable; many very fine and fine roots and few medium roots; very strongly acid (pH 5.0 in water 1:1); abrupt smooth boundary.
E—1 to 6 inches; grayish brown (10YR 5/2) sandy loam, light gray (10YR 7/2) dry; weak fine subangular blocky structure; friable; common very fine and fine roots; about 1 percent gravel; very strongly acid; abrupt wavy boundary.
Bs1—6 to 11 inches; brown (7.5YR 4/4) sandy loam; weak fine subangular blocky structure; friable; common very fine and fine roots; about 1 percent gravel; very strongly acid; clear wavy boundary.
Bs2—11 to 20 inches; brown (7.5YR 4/4) sandy loam; weak fine subangular blocky structure; friable; common very fine and fine roots; about 1 percent gravel; strongly acid; abrupt wavy boundary.
E/B—20 to 26 inches; 70 percent brown (7.5YR 5/3) sandy loam (E´), pink (7.5YR 7/3) dry; weak medium subangular blocky structure; friable; tonguing into and surrounding remnants of strong brown (7.5YR 4/6) sandy loam (Bt); weak medium subangular blocky structure; friable; few very fine

and fine roots; about 2 percent gravel; strongly acid; clear wavy boundary.
Bt1—26 to 30 inches; strong brown (7.5YR 4/6) sandy loam; weak fine subangular blocky structure; friable; few very fine and fine roots; common distinct brown (7.5YR 4/4) clay bridging between sand grains; about 2 percent gravel; strongly acid; abrupt wavy boundary.
2Bt2—30 to 33 inches; strong brown (7.5YR 4/6) loamy sand; weak fine subangular blocky structure; very friable; few very fine and fine roots; common distinct brown (7.5YR 4/4) clay bridging between sand grains; about 2 percent gravel; strongly acid; clear wavy boundary.
2C1—33 to 46 inches; strong brown (7.5YR 4/6) sand; single grain; loose; about 5 percent gravel; strongly acid; clear wavy boundary.
3C2—46 to 61 inches; stratified silt loam, fine sandy loam, and sand; yellowish red (5YR 5/6), pinkish gray (7.5YR 6/2), brown (7.5YR 5/3), and yellowish brown (10YR 5/4) in the silt loam and fine sandy loam and brown (7.5YR 4/4) in the sand; single grain in the sand and massive in the loamy strata; loose in the sand and friable in the loamy strata; common medium distinct strong brown (7.5YR 5/6) masses of iron accumulation; about 5 percent gravel in the sand; strongly acid.

Range in Characteristics

Thickness of the solum: 24 to 40 inches
Thickness of the loamy mantle: 24 to 40 inches
Depth to stratified lacustrine deposits: 40 to 60 inches
Content of gravel: 0 to 15 percent in the upper part of the solum; 0 to 35 percent in the lower part of the solum and the upper part of the substratum; 0 to 5 percent in the lower part of the substratum
Content of cobbles: 0 to 5 percent in the solum and the upper part of the substratum
Note: Unless otherwise stated, depths and thicknesses are measured from the top of the mineral soil.

O horizon:
Hue—10YR, 7.5YR, 5YR, or N
Value—2 to 3
Chroma—0 to 2
Texture—sapric or hemic material

A horizon (if it occurs):
Hue—10YR, 7.5YR, or 5YR
Value—2 to 3
Chroma—1 or 2
Texture—sandy loam

E horizon:
Hue—10YR, 7.5YR, or 5YR
Value—4 or 5
Chroma—2 or 3
Texture—sandy loam

Bs horizon:
Hue—7.5YR or 5YR
Value—3 or 4
Chroma—4
Texture—sandy loam

E´ part of E/B horizon:
Hue—10YR, 7.5YR, or 5YR
Value—4 or 5
Chroma—3
Texture—sandy loam or fine sandy loam

Bt horizon and Bt part of E/B horizon:
Hue—10YR, 7.5YR, or 5YR
Value—4 or 5
Chroma—4 or 6
Texture—sandy loam, fine sandy loam, or loam

2Bt horizon:
Hue—10YR, 7.5YR, or 5YR
Value—4 to 6
Chroma—4 or 6
Texture—loamy sand or gravelly loamy sand

2C horizon:
Hue—10YR, 7.5YR, or 5YR
Value—4 to 6
Chroma—3 to 6
Texture—sand, coarse sand, or the gravelly analogs of these textures

3C horizon:
Hue—10YR, 7.5YR, or 5YR
Value—4 to 6
Chroma—2 to 6
Texture—stratified silt loam, fine sandy loam, and sand

Pelissier Series

Depth class: Very deep
Drainage class: Excessively drained
Permeability: Moderately rapid in the upper part and very rapid in the lower part
Landform: Eskers
Parent material: Primarily loamy deposits underlain by sandy and gravelly glacial outwash
Slope range: 20 to 45 percent

Taxonomic classification: Sandy-skeletal, mixed, frigid Entic Haplorthods

Typical Pedon

Pelissier gravelly sandy loam, 20 to 45 percent slopes, stony, approximately 1,895 feet east of the northwest corner of sec. 29, T. 37 N., R. 12 E.

Oi—0 to 1 inch; peat (fibric material, which is a mat of partially decomposed forest litter), black (10YR 2/1) broken face and rubbed; about 90 percent fiber, 60 percent rubbed; massive; very friable; many very fine and fine roots; moderately acid (pH 5.6 in water 1:1); abrupt smooth boundary.

E—1 to 3 inches; brown (7.5YR 5/2) gravelly sandy loam, pinkish gray (7.5YR 7/2) dry; weak fine and medium subangular blocky structure; very friable; many very fine and fine roots and few medium and coarse roots; about 25 percent gravel and 5 percent cobbles; strongly acid; abrupt wavy boundary.

Bs1—3 to 8 inches; dark brown (7.5YR 3/4) gravelly coarse sandy loam; weak medium subangular blocky structure; very friable; many very fine and fine roots and few medium and coarse roots; about 25 percent gravel and 5 percent cobbles; strongly acid; clear wavy boundary.

Bs2—8 to 18 inches; brown (7.5YR 4/4) very gravelly loamy coarse sand; weak medium subangular blocky structure; very friable; common very fine and fine roots and few medium and coarse roots; about 45 percent gravel and 5 percent cobbles; strongly acid; clear wavy boundary.

BC—18 to 22 inches; strong brown (7.5YR 4/6) very gravelly loamy coarse sand; weak medium subangular blocky structure; very friable; few very fine and fine roots; about 50 percent gravel and 5 percent cobbles; moderately acid; gradual wavy boundary.

C—22 to 61 inches; yellowish brown (10YR 5/4) very gravelly coarse sand; single grain; loose; about 45 percent gravel and 10 percent cobbles; neutral.

Range in Characteristics

Thickness of the solum: 18 to 40 inches
Thickness of the loamy mantle: 2 to 20 inches
Content of gravel: 15 to 35 percent in the upper part of the solum; 25 to 60 percent in the lower part of the solum and in the substratum
Content of cobbles: 0 to 40 percent throughout the profile
Content of stones: 0 to 2 percent throughout the profile
Percent of surface covered by stones: 0.01 to 0.1
Note: Unless otherwise stated, depths and thicknesses are measured from the top of the mineral soil.

O horizon:
Hue—10YR, 7.5YR, 5YR, or N
Value—2 to 3
Chroma—0 to 2
Texture—sapric, hemic, or fibric material

A horizon (if it occurs):
Hue—10YR, 7.5YR, or 5YR
Value—2 to 3
Chroma—1 or 2
Texture—gravelly sandy loam

E horizon:
Hue—7.5YR or 5YR
Value—4 to 6
Chroma—2 or 3
Texture—gravelly sandy loam

Bs horizon:
Hue—7.5YR or 5YR
Value—3 or 4
Chroma—4
Texture—the gravelly, very gravelly, cobbly, or very cobbly analogs of sandy loam, coarse sandy loam, loamy sand, loamy coarse sand, sand, or coarse sand

C horizon:
Hue—10YR or 7.5YR
Value—5 or 6
Chroma—3 to 6
Texture—the very gravelly, extremely gravelly, very cobbly, or extremely cobbly analogs of sand or coarse sand

Pence Series

Depth class: Very deep
Drainage class: Somewhat excessively drained
Permeability: Moderate or moderately rapid in the upper part and moderately rapid to very rapid in the lower part
Landform: Outwash plains, stream terraces, eskers, and kames
Parent material: Primarily loamy deposits underlain by sandy and gravelly glacial outwash
Slope range: 0 to 35 percent

Taxonomic classification: Sandy, mixed, frigid Entic Haplorthods

Typical Pedon

Pence sandy loam, 6 to 15 percent slopes (fig. 23), approximately 1,200 feet west and 1,500 feet south of the northeast corner of sec. 20, T. 40 N., R. 12 E.

Oe—0 to 2 inches; mucky peat (hemic material, which

is a mat of partially decomposed forest litter), black (5YR 2.5/1) broken face and rubbed; about 40 percent fiber, 20 percent rubbed; weak fine granular structure; very friable; many very fine and fine roots and few medium roots; very strongly acid (pH 4.5 in water 1:1); abrupt smooth boundary.

E—2 to 4 inches; dark reddish gray (5YR 4/2) sandy loam, gray (5YR 6/1) dry; weak medium subangular blocky structure; friable; many fine and common medium roots; about 5 percent gravel; strongly acid; abrupt smooth boundary.

Bhs—4 to 6 inches; dark reddish brown (5YR 3/3) sandy loam; weak medium subangular blocky structure; friable; many fine and common medium roots; about 5 percent gravel; strongly acid; abrupt wavy boundary.

Bs—6 to 16 inches; reddish brown (5YR 4/4) sandy loam; weak medium subangular blocky structure; friable; common fine and few medium roots; about 5 percent gravel; strongly acid; clear wavy boundary.

2BC—16 to 22 inches; strong brown (7.5YR 4/6) loamy sand; moderate medium subangular blocky structure; friable; few fine and medium roots; about 5 percent gravel; strongly acid; abrupt wavy boundary.

2C—22 to 62 inches; strong brown (7.5YR 4/6) gravelly sand; single grain; loose; about 25 percent gravel and 8 percent cobbles; slightly acid.

Range in Characteristics

Thickness of the solum: 18 to 36 inches
Thickness of the loamy mantle: 10 to 20 inches
Content of gravel: 0 to 35 percent in the upper part of the solum; 3 to 35 percent in the lower part of the solum; 15 to 35 percent in the substratum
Content of cobbles: 0 to 10 percent throughout the profile
Note: Unless otherwise stated, depths and thicknesses are measured from the top of the mineral soil.

O horizon:
Hue—10YR, 7.5YR, 5YR, or N
Value—2 to 3
Chroma—0 to 2
Texture—hemic or sapric material

A horizon (if it occurs):
Hue—10YR, 7.5YR, 5YR, or N
Value—2 to 3
Chroma—0 to 2
Texture—sandy loam

E horizon:
Hue—7.5YR or 5YR
Value—4 to 6
Chroma—2
Texture—sandy loam

Bhs horizon:
Hue—7.5YR or 5YR
Value—3
Chroma—2 or 3
Texture—sandy loam or gravelly sandy loam

Bs horizon:
Hue—7.5YR or 5YR
Value—3 or 4
Chroma—4
Texture—sandy loam or gravelly sandy loam

2C horizon:
Hue—10YR, 7.5YR, or 5YR
Value—4 to 6
Chroma—4 or 6
Texture—gravelly sand, gravelly coarse sand, or stratified sand, gravelly sand, and gravelly coarse sand

Rubicon Series

Depth class: Very deep
Drainage class: Excessively drained
Permeability: Rapid
Landform: Outwash plains, stream terraces, and kames
Parent material: Sandy glacial outwash
Slope range: 15 to 35 percent

Taxonomic classification: Sandy, mixed, frigid Entic Haplorthods

Typical Pedon

Rubicon loamy sand, 15 to 35 percent slopes, approximately 1,100 feet east and 2,400 feet south of the northwest corner of sec. 28, T. 35 N., R. 13 E.

A—0 to 1 inch; black (10YR 2/1) loamy sand, gray (10YR 5/1) dry; weak fine granular structure; very friable; common very fine and fine roots and few medium roots; strongly acid; abrupt wavy boundary.

E—1 to 4 inches; brown (7.5YR 4/2) loamy sand, pinkish gray (7.5YR 6/2) dry; weak thin platy structure; very friable; common very fine and fine roots and few medium roots; strongly acid; clear wavy boundary.

Bs1—4 to 8 inches; brown (7.5YR 4/4) sand; weak

fine subangular blocky structure; very friable; few very fine, fine, medium, and coarse roots; strongly acid; gradual wavy boundary.
Bs2—8 to 15 inches; brown (7.5YR 4/4) sand; weak fine subangular blocky structure; very friable; few very fine, fine, medium, and coarse roots; moderately acid; gradual wavy boundary.
BC—15 to 25 inches; dark yellowish brown (10YR 4/6) sand; weak fine subangular blocky structure; very friable; few medium roots; moderately acid; gradual wavy boundary.
C—25 to 60 inches; yellowish brown (10YR 5/4) sand; single grain; loose; slightly acid.

Range in Characteristics

Thickness of the solum: 20 to 40 inches
Thickness of the loamy sand mantle: 0 to 9 inches
Content of gravel: 0 to 15 percent throughout the profile

O horizon (if it occurs):
Hue—10YR, 7.5YR, 5YR, or N
Value—2 to 3
Chroma—0 to 2
Texture—sapric or hemic material

A horizon:
Hue—10YR, 7.5YR, 5YR, or N
Value—2 to 3
Chroma—0 to 2
Texture—loamy sand

E horizon:
Hue—10YR, 7.5YR, or 5YR
Value—4 to 6
Chroma—2 or 3
Texture—loamy sand or sand

Bs horizon:
Hue—7.5YR or 5YR
Value—3 or 4
Chroma—4
Texture—sand

C horizon:
Hue—10YR, 7.5YR, or 5YR
Value—4 to 6
Chroma—4 to 8
Texture—sand or coarse sand

Sarona Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate or moderately rapid
Landform: Drumlins and moraines
Parent material: Primarily loamy deposits underlain by sandy or loamy glacial till or glacial mudflow sediment
Slope range: 6 to 35 percent

Taxonomic classification: Coarse-loamy, mixed, frigid Alfic Haplorthods

Typical Pedon

Sarona sandy loam (fig. 24), in an area of Laona-Sarona sandy loams, 15 to 35 percent slopes, very stony, approximately 850 feet east and 1,200 feet north of the southwest corner of sec. 22, T. 36 N., R. 12 E.

A—0 to 1 inch; very dark gray (10YR 3/1) sandy loam, gray (10YR 6/1) dry; moderate medium granular structure; very friable; common fine and few medium roots; about 1 percent gravel and 1 percent cobbles; moderately acid; abrupt smooth boundary.
E—1 to 3 inches; brown (7.5YR 5/2) sandy loam, pinkish gray (7.5YR 7/2) dry; weak thin platy structure; very friable; common fine and few medium roots; about 1 percent gravel and 1 percent cobbles; strongly acid; abrupt wavy boundary.
Bs1—3 to 9 inches; dark brown (7.5YR 3/4) sandy loam; weak fine subangular blocky structure; very friable; common fine and few medium roots; about 2 percent gravel and 1 percent cobbles; strongly acid; clear wavy boundary.
Bs2—9 to 22 inches; brown (7.5YR 4/4) sandy loam; weak medium subangular blocky structure; very friable; few fine and medium roots; about 2 percent gravel and 1 percent cobbles; strongly acid; clear wavy boundary.
E/B—22 to 38 inches; 70 percent brown (7.5YR 5/3) gravelly loamy sand (E´), pink (7.5YR 7/3) dry; weak medium subangular blocky structure; friable; tonguing into and surrounding remnants of strong brown (7.5YR 4/6) gravelly sandy loam (Bt); weak medium subangular blocky structure; friable; few fine roots; about 20 percent gravel and 2 percent cobbles; very strongly acid; gradual wavy boundary.
B/E—38 to 47 inches; 70 percent strong brown (7.5YR 4/6) gravelly sandy loam (Bt); moderate medium subangular blocky structure; friable; common faint brown (7.5YR 4/3) clay films on faces of peds; penetrated by tongues of brown (7.5YR 5/3) gravelly loamy sand (E´), pink (7.5YR 7/3) dry; moderate medium subangular blocky structure; friable; few fine roots; about 22 percent gravel and 2 percent cobbles; strongly acid; clear wavy boundary.

Bt—47 to 56 inches; brown (7.5YR 4/4) gravelly loamy sand; weak medium subangular blocky structure; very friable; few faint dark brown (7.5YR 3/4) clay films on faces of peds and clay bridging between sand grains; about 25 percent gravel and 3 percent cobbles; moderately acid; gradual wavy boundary.
C—56 to 60 inches; brown (7.5YR 5/4) gravelly loamy sand; massive; very friable; about 25 percent gravel and 3 percent cobbles; moderately acid.

Range in Characteristics

Thickness of the solum: 35 to more than 60 inches
Content of gravel: 1 to 35 percent throughout the profile
Content of cobbles: 0 to 10 percent throughout the profile
Content of stones: 0 to 5 percent throughout the profile
Percent of surface covered by stones: 0.1 to 3.0

O horizon (if it occurs):
Hue—10YR, 7.5YR, or N
Value—2 to 3
Chroma—0 to 2
Texture—sapric or hemic material

A horizon:
Hue—10YR, 7.5YR, or 5YR
Value—2 to 3
Chroma—1 or 2
Texture—sandy loam

E horizon:
Hue—10YR, 7.5YR, or 5YR
Value—4 or 5
Chroma—2 or 3
Texture—sandy loam

Bs horizon:
Hue—7.5YR or 5YR
Value—3 or 4
Chroma—4
Texture—sandy loam

E´ part of E/B and B/E horizons:
Hue—10YR, 7.5YR, or 5YR
Value—5 or 6
Chroma—3
Texture—loamy sand, loamy fine sand, sandy loam, fine sandy loam, or the gravelly analogs of these textures

Bt horizon and Bt part of E/B and B/E horizons:
Hue—10YR, 7.5YR, or 5YR
Value—3 or 4
Chroma—4 or 6
Texture—sandy loam, loamy sand, or the gravelly analogs of these textures

C horizon:
Hue—10YR, 7.5YR, or 5YR
Value—4 to 6
Chroma—4 or 6
Texture—sandy loam, loamy sand, or the gravelly analogs of these textures

Sarwet Series

Depth class: Very deep
Drainage class: Moderately well drained
Permeability: Moderate
Landform: Drumlins and moraines
Parent material: Primarily loamy deposits underlain by sandy or loamy glacial till or glacial mudflow sediment
Slope range: 1 to 6 percent

Taxonomic classification: Coarse-loamy, mixed, frigid Oxyaquic Haplorthods

Typical Pedon

Sarwet sandy loam, in an area of Argonne-Sarwet sandy loams, 1 to 6 percent slopes, very stony, approximately 300 feet west and 400 feet north of the southeast corner of sec. 26, T. 36 N., R. 16 E.

A—0 to 1 inch; dark reddish brown (5YR 2.5/2) sandy loam, dark gray (5YR 4/1) dry; weak fine granular structure; friable; many very fine and fine roots; about 1 percent gravel; slightly acid; clear wavy boundary.
E—1 to 3 inches; dark reddish gray (5YR 4/2) sandy loam, pinkish gray (5YR 6/2) dry; weak thick platy structure parting to weak fine subangular blocky; friable; common very fine and fine roots; about 1 percent gravel; strongly acid; clear wavy boundary.
Bs1—3 to 12 inches; brown (7.5YR 4/4) sandy loam; weak medium subangular blocky structure; friable; common very fine and few fine roots; about 1 percent gravel; strongly acid; gradual wavy boundary.
Bs2—12 to 18 inches; brown (7.5YR 4/4) sandy loam; weak medium subangular blocky structure; friable; few very fine and fine roots; about 1 percent gravel; strongly acid; gradual wavy boundary.
B/E—18 to 27 inches; 75 percent brown (7.5YR 4/4) sandy loam (Bt); weak medium subangular blocky structure; friable; common faint dark brown (7.5YR 3/4) clay films on faces of peds; penetrated by tongues of brown (7.5YR 5/3) sandy loam (E´), light brown (7.5YR 6/3) dry; weak medium

subangular blocky structure; friable; few very fine and fine roots; about 5 percent gravel; strongly acid; clear wavy boundary.
Bt—27 to 34 inches; strong brown (7.5YR 4/6) sandy loam; weak medium subangular blocky structure; friable; few very fine and fine roots; common distinct brown (7.5YR 4/4) clay films on faces of peds; few fine faint strong brown (7.5YR 5/6) masses of iron accumulation; about 5 percent gravel; strongly acid; clear wavy boundary.
BC—34 to 48 inches; brown (7.5YR 4/4) sandy loam; weak fine subangular blocky structure; friable; few very fine roots; few fine distinct strong brown (7.5YR 5/6) masses of iron accumulation; about 6 percent gravel and 1 percent cobbles; strongly acid; gradual wavy boundary.
C—48 to 60 inches; dark yellowish brown (10YR 4/4) sandy loam; massive; friable; few very fine roots; few fine distinct yellowish brown (10YR 5/6) masses of iron accumulation; about 10 percent gravel and 2 percent cobbles; strongly acid.

Range in Characteristics

Thickness of the solum: 35 to more than 60 inches
Content of gravel: 1 to 35 percent throughout the profile
Content of cobbles: 0 to 10 percent throughout the profile
Content of stones: 0 to 5 percent throughout the profile
Percent of surface covered by stones: 0.1 to 3.0

O horizon (if it occurs):
Hue—10YR, 7.5YR, or N
Value—2 to 3
Chroma—0 to 2
Texture—sapric or hemic material

A horizon:
Hue—10YR, 7.5YR, or 5YR
Value—2 to 3
Chroma—1 or 2
Texture—sandy loam

E horizon:
Hue—10YR, 7.5YR, or 5YR
Value—4 or 5
Chroma—2 or 3
Texture—sandy loam

Bs horizon:
Hue—7.5YR or 5YR
Value—3 or 4
Chroma—4
Texture—sandy loam

E´ part of B/E horizon:
Hue—10YR, 7.5YR, or 5YR
Value—5 or 6
Chroma—3
Texture—loamy sand, loamy fine sand, fine sandy loam, sandy loam, or the gravelly analogs of these textures

Bt horizon and Bt part of B/E horizon:
Hue—7.5YR or 5YR
Value—4
Chroma—4 or 6
Texture—sandy loam, loamy sand, or the gravelly analogs of these textures

C horizon:
Hue—10YR, 7.5YR, or 5YR
Value—4 to 6
Chroma—4 or 6
Texture—sandy loam, loamy sand, or the gravelly analogs of these textures

Soperton Series

Depth class: Moderately deep to a fragipan
Drainage class: Well drained
Permeability: Moderate in the upper part, slow in the fragipan, and moderate or moderately rapid in the lower part
Landform: Drumlins and moraines
Parent material: Primarily silty deposits underlain by sandy or loamy glacial till or glacial mudflow sediment
Slope range: 15 to 35 percent

Taxonomic classification: Coarse-loamy, mixed, frigid Alfic Fragiorthods

Typical Pedon

Soperton silt loam, in an area of Soperton-Goodman silt loams, 15 to 35 percent slopes, very stony, approximately 1,200 feet west and 1,700 feet north of the southeast corner of sec. 22, T. 36 N., R. 12 E.

Oa—0 to 1 inch; muck (sapric material, which is a mat of partially decomposed forest litter), black (10YR 2/1) broken face and rubbed; about 20 percent fiber, 5 percent rubbed; weak fine granular structure; very friable; many very fine and fine roots and common medium roots; strongly acid (pH 5.1 in water 1:1); abrupt smooth boundary.
A—1 to 6 inches; dark brown (7.5YR 3/2) silt loam, brown (7.5YR 5/2) dry; moderate medium subangular blocky structure parting to moderate

fine subangular blocky; friable; many very fine and fine roots and common medium roots; about 1 percent gravel and 1 percent cobbles; moderately acid; abrupt wavy boundary.

E—6 to 8 inches; brown (7.5YR 5/2) silt loam, pinkish gray (7.5YR 7/2) dry; weak medium subangular blocky structure parting to weak fine subangular blocky; friable; common very fine and fine roots and few medium roots; about 1 percent gravel and 1 percent cobbles; moderately acid; abrupt wavy boundary.

Bs—8 to 15 inches; brown (7.5YR 4/4) silt loam; moderate medium subangular blocky structure parting to moderate fine subangular blocky; friable; common very fine and fine roots and few medium roots; about 1 percent gravel and 1 percent cobbles; strongly acid; clear wavy boundary.

E/B—15 to 21 inches; 80 percent brown (7.5YR 5/3) silt loam (E´), pinkish gray (7.5YR 7/2) dry; moderate medium platy structure; friable; tonguing into and surrounding remnants of brown (7.5YR 4/4) silt loam (Bt); moderate medium subangular blocky structure; friable; common very fine and fine roots and few medium roots; about 3 percent gravel and 1 percent cobbles; strongly acid; clear wavy boundary.

2B/E—21 to 29 inches; 60 percent brown (7.5YR 4/4) gravelly sandy loam (2Bt); weak medium subangular blocky structure; friable; common faint brown (7.5YR 4/3) clay films on faces of peds; penetrated by tongues of brown (7.5YR 5/3) gravelly sandy loam (2E´), pinkish gray (7.5YR 7/2) dry; weak medium subangular blocky structure; friable; few very fine and fine roots; about 15 percent gravel and 3 percent cobbles; strongly acid; clear wavy boundary.

2Btx—29 to 37 inches; brown (7.5YR 4/4) gravelly sandy loam; weak medium subangular blocky structure; firm; brittle; tends to part along horizontal cleavage planes inherited from the parent material; common faint brown (7.5YR 4/3) clay films on faces of peds; about 15 percent gravel and 3 percent cobbles; moderately acid; clear wavy boundary.

2BC—37 to 46 inches; brown (7.5YR 5/4) gravelly sandy loam; weak coarse subangular blocky structure; friable; about 20 percent gravel and 3 percent cobbles; moderately acid; gradual wavy boundary.

2C—45 to 61 inches; brown (7.5YR 5/4) gravelly loamy sand; massive; friable; about 20 percent gravel and 3 percent cobbles; slightly acid.

Range in Characteristics

Thickness of the solum: 40 to more than 60 inches
Thickness of the silty mantle: 12 to 36 inches
Depth to the fragipan: 20 to 40 inches
Content of gravel: 0 to 10 percent in the upper part of the solum; 5 to 25 percent in the lower part of the solum and in the substratum
Content of cobbles: 0 to 10 percent in the upper part of the solum; 0 to 20 percent in the lower part of the solum and in the substratum
Content of stones: 0 to 5 percent throughout the profile
Percent of surface covered by stones: 0.1 to 3.0
Note: Unless otherwise stated, depths and thicknesses are measured from the top of the mineral soil.

O horizon:
Hue—10YR, 7.5YR, or N
Value—2 to 3
Chroma—0 to 2
Texture—sapric or hemic material

A horizon:
Hue—10YR, 7.5YR, or 5YR
Value—2 to 3
Chroma—1 or 2
Texture—silt loam

E horizon:
Hue—10YR, 7.5YR, or 5YR
Value—4 to 7
Chroma—2 or 3
Texture—silt loam or silt

Bs horizon:
Hue—7.5YR or 5YR
Value—3 or 4
Chroma—4
Texture—silt loam

E´ part of E/B horizon:
Hue—10YR or 7.5YR
Value—4 to 7
Chroma—2 or 3
Texture—silt loam or silt

Bt part of E/B horizon:
Hue—10YR or 7.5YR
Value—3 or 4
Chroma—4 or 6
Texture—silt loam

2Btx horizon and 2Bt part of 2B/E horizon:
Hue—10YR or 7.5YR
Value—3 to 5

Chroma—4 or 6
Texture—sandy loam, loam, or the gravelly or cobbly analogs of these textures

2E´ part of 2B/E horizon:
Hue—10YR or 7.5YR
Value—4 to 7
Chroma—2 or 3
Texture—sandy loam, loamy sand, loam, or the gravelly or cobbly analogs of these textures

2C horizon:
Hue—10YR or 7.5YR
Value—3 to 6
Chroma—4 or 6
Texture—loamy sand, sandy loam, or the gravelly or cobbly analogs of these textures

Stambaugh Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate or moderately slow in the solum and very rapid in the substratum
Landform: Outwash plains and stream terraces
Parent material: Primarily silty deposits underlain by sandy and gravelly glacial outwash
Slope range: 0 to 25 percent

Taxonomic classification: Coarse-silty over sandy or sandy-skeletal, mixed, frigid Alfic Haplorthods

Typical Pedon

Stambaugh silt loam, 0 to 6 percent slopes, approximately 1,000 feet west and 500 feet north of the southeast corner of sec. 26, T. 34 N., R. 15 E.

A—0 to 3 inches; dark brown (7.5YR 3/2) silt loam, brown (7.5YR 5/2) dry; weak very fine subangular blocky structure; friable; many fine and common medium roots; about 2 percent gravel; moderately acid; abrupt smooth boundary.
E—3 to 4 inches; brown (7.5YR 5/2) silt loam, pinkish gray (7.5YR 7/2) dry; weak thin platy structure; very friable; common fine and few medium roots; about 2 percent gravel; strongly acid; abrupt broken boundary.
Bs—4 to 14 inches; brown (7.5YR 4/4) silt loam; weak medium subangular blocky structure; very friable; common fine and few medium roots; about 2 percent gravel; very strongly acid; clear smooth boundary.
E/B—14 to 24 inches; 70 percent brown (7.5YR 5/2) silt loam (E´), pink (7.5YR 7/3) dry; moderate medium subangular blocky structure; friable; tonguing into and surrounding remnants of brown (7.5YR 4/4) silt loam (Bt); moderate medium subangular blocky structure; friable; common fine and few medium roots; few faint dark brown (7.5YR 3/4) clay films on faces of peds; about 3 percent gravel; very strongly acid; clear wavy boundary.
Bt1—24 to 31 inches; brown (7.5YR 4/4) silt loam; moderate medium subangular blocky structure; friable; common fine and few medium roots; common faint dark brown (7.5YR 3/4) clay films on faces of peds; about 3 percent gravel; very strongly acid; clear wavy boundary.
2Bt2—31 to 35 inches; brown (7.5YR 4/4) gravelly sandy loam; weak medium subangular blocky structure; friable; few fine and medium roots; clay bridging between sand grains; about 20 percent gravel; very strongly acid; abrupt wavy boundary.
2C—35 to 60 inches; strong brown (7.5YR 4/6) gravelly sand; single grain; loose; about 30 percent gravel and 3 percent cobbles; strongly acid.

Range in Characteristics

Thickness of the solum: 24 to 40 inches
Thickness of the silty mantle: 24 to 40 inches
Content of gravel: 0 to 5 percent in the upper part of the solum; 5 to 30 percent in the lower part of the solum; 25 to 55 percent in the substratum
Content of cobbles: 0 to 5 percent throughout the profile

O horizon (if it occurs):
Hue—10YR, 7.5YR, 5YR, or N
Value—2 to 3
Chroma—0 to 2
Texture—sapric or hemic material

A horizon:
Hue—10YR, 7.5YR, or 5YR
Value—2 to 3
Chroma—1 or 2
Texture—silt loam

E horizon:
Hue—10YR, 7.5YR, or 5YR
Value—4 to 6
Chroma—2
Texture—silt loam

Bs horizon:
Hue—7.5YR or 5YR
Value—3 or 4
Chroma—4
Texture—silt loam

E´ part of E/B horizon:
Hue—10YR or 7.5YR

Value—4 or 5
Chroma—2 or 3
Texture—silt loam or very fine sandy loam

Bt horizon and Bt part of E/B horizon:
Hue—7.5YR or 5YR
Value—3 or 4
Chroma—4
Texture—silt loam

2Bt horizon:
Hue—7.5YR or 5YR
Value—4
Chroma—4 or 6
Texture—sandy loam, loam, or the gravelly analogs of these textures

2C horizon:
Hue—10YR, 7.5YR, or 5YR
Value—4 or 5
Chroma—3 to 6
Texture—gravelly or very gravelly sand

Tipler Series

Depth class: Very deep
Drainage class: Moderately well drained
Permeability: Moderate in the solum and rapid or very rapid in the substratum
Landform: Outwash plains and stream terraces
Parent material: Loamy deposits underlain by sandy or sandy and gravelly glacial outwash
Slope range: 0 to 3 percent

Taxonomic classification: Coarse-loamy, mixed, frigid Oxyaquic Haplorthods

Typical Pedon

Tipler sandy loam, 0 to 3 percent slopes (fig. 25), approximately 155 feet west and 800 feet north of the southeast corner of sec. 14, T. 37 N., R. 16 E.

A—0 to 3 inches; dark brown (7.5YR 3/2) sandy loam, brown (7.5YR 4/2) dry; weak medium subangular blocky structure parting to weak fine granular; friable; many very fine and fine roots and common medium roots; about 3 percent gravel and 1 percent cobbles; strongly acid; abrupt wavy boundary.

E—3 to 5 inches; brown (7.5YR 5/3) sandy loam, pinkish gray (7.5YR 7/2) dry; weak fine subangular blocky structure parting to weak fine granular; friable; many very fine and fine roots and common medium roots; about 3 percent gravel and 1 percent cobbles; very strongly acid; abrupt broken boundary.

Bs1—5 to 10 inches; dark brown (7.5YR 3/4) sandy loam; weak medium subangular blocky structure parting to weak fine granular; friable; common very fine and fine roots and few medium roots; about 5 percent gravel and 1 percent cobbles; very strongly acid; clear wavy boundary.

Bs2—10 to 19 inches; brown (7.5YR 4/4) sandy loam; weak medium subangular blocky structure parting to weak fine granular; friable; few very fine, fine, and medium roots; about 5 percent gravel and 1 percent cobbles; very strongly acid; clear wavy boundary.

B/E—19 to 26 inches; 80 percent brown (7.5YR 4/4) sandy loam (Bt); weak medium subangular blocky structure parting to weak medium platy; friable; common faint brown (7.5YR 4/3) clay films on faces of peds; penetrated by tongues of light brown (7.5YR 6/3) sandy loam (E´), pink (7.5YR 7/3) dry; weak medium subangular blocky structure parting to weak medium platy; friable; few very fine, fine, and medium roots; about 3 percent gravel and 1 percent cobbles; strongly acid; abrupt wavy boundary.

Bt—26 to 33 inches; strong brown (7.5YR 4/6) sandy loam; weak medium subangular blocky structure; friable; few very fine roots; common distinct brown (7.5YR 4/4) clay films on faces of peds; common fine distinct yellowish red (5YR 4/6) masses of iron accumulation; about 9 percent gravel and 5 percent cobbles; strongly acid; clear wavy boundary.

2C—33 to 60 inches; brown (7.5YR 5/4), stratified very gravelly coarse sand and gravelly coarse sand; single grain; loose; common fine prominent yellowish red (5YR 5/6) masses of iron accumulation; about 34 percent gravel and 5 percent cobbles; slightly acid.

Range in Characteristics

Thickness of the solum: 24 to 40 inches
Thickness of the loamy mantle: 24 to 40 inches
Content of gravel: 0 to 15 percent in the upper part of the solum; 3 to 50 percent in the lower part of the solum and in the substratum
Content of cobbles: 0 to 5 percent throughout the profile

O horizon (if it occurs):
Hue—10YR, 7.5YR, or N
Value—2 to 3
Chroma—0 to 2
Texture—sapric or hemic material

A horizon:
Hue—10YR, 7.5YR, or 5YR

Value—2 to 3
Chroma—1 or 2
Texture—sandy loam

E horizon:
Hue—10YR, 7.5YR, or 5YR
Value—4 to 6
Chroma—2 or 3
Texture—sandy loam

Bs horizon:
Hue—7.5YR or 5YR
Value—3 or 4
Chroma—4
Texture—sandy loam

Bt horizon and Bt part of B/E horizon:
Hue—10YR, 7.5YR, or 5YR
Value—4 or 5
Chroma—4 or 6
Texture—sandy loam, fine sandy loam, or loam

E´ part of B/E horizon:
Hue—10YR, 7.5YR, or 5YR
Value—4 to 6
Chroma—2 or 3
Texture—sandy loam or fine sandy loam

2C horizon:
Hue—10YR, 7.5YR, or 5YR
Value—4 to 6
Chroma—3 to 6
Texture—stratified sand, coarse sand, or the gravelly or very gravelly analogs of these textures

Vanzile Series

Depth class: Very deep
Drainage class: Moderately well drained
Permeability: Moderate or moderately slow in the solum and rapid or very rapid in the substratum
Landform: Outwash plains and stream terraces
Parent material: Primarily silty deposits underlain by sandy or sandy and gravelly glacial outwash
Slope range: 0 to 6 percent

Taxonomic classification: Coarse-silty over sandy or sandy-skeletal, mixed, frigid Alfic Haplorthods

Typical Pedon

Vanzile silt loam, 0 to 6 percent slopes (fig. 26), approximately 600 feet east and 200 feet north of the southwest corner of sec. 4, T. 40 N., R. 12 E.

A—0 to 3 inches; dark brown (7.5YR 3/2) silt loam, brown (7.5YR 5/2) dry; weak fine granular structure; very friable; many fine and common medium roots; moderately acid; abrupt smooth boundary.
E—3 to 4 inches; brown (7.5YR 4/2) silt loam, pinkish gray (7.5YR 6/2) dry; weak thin platy structure; very friable; common fine and few medium roots; moderately acid; abrupt smooth boundary.
Bs1—4 to 8 inches; dark brown (7.5YR 3/4) silt loam; weak medium subangular blocky structure; very friable; common fine and few medium roots; moderately acid; clear wavy boundary.
Bs2—8 to 14 inches; brown (7.5YR 4/4) silt loam; weak medium subangular blocky structure; very friable; common fine and few medium roots; moderately acid; clear wavy boundary.
E/B—14 to 21 inches; 70 percent brown (7.5YR 4/3) silt loam (E´), pink (7.5YR 7/3) dry; moderate medium subangular blocky structure; friable; tonguing into and surrounding remnants of reddish brown (5YR 4/4) silt loam (Bt); moderate medium subangular blocky structure; friable; few fine and medium roots; few faint reddish brown (5YR 4/3) clay films on faces of peds; about 2 percent gravel; very strongly acid; gradual wavy boundary.
B/E—21 to 26 inches; 65 percent reddish brown (5YR 4/4) silt loam (Bt); moderate medium subangular blocky structure; friable; few faint reddish brown (5YR 4/3) clay films on faces of peds; penetrated by tongues of brown (7.5YR 4/3) silt loam (E´), pink (7.5YR 7/3) dry; moderate medium subangular blocky structure; friable; few fine and medium roots; about 2 percent gravel; very strongly acid; clear wavy boundary.
2Bt—26 to 30 inches; brown (7.5YR 4/4) loam; weak coarse subangular blocky structure; friable; few fine and medium roots; few faint brown (7.5YR 4/3) clay films on faces of peds; common fine prominent reddish yellow (5YR 6/8) masses of iron accumulation; about 5 percent gravel; very strongly acid; abrupt wavy boundary.
3C—30 to 60 inches; strong brown (7.5YR 5/6), stratified sand and gravelly sand; single grain; loose; about 30 percent gravel and 3 percent cobbles; moderately acid.

Range in Characteristics

Thickness of the solum: 20 to 40 inches
Thickness of the silty mantle: 20 to 40 inches
Content of gravel: 0 to 5 percent in the upper part of the solum; 3 to 45 percent in the lower part of the solum and in the substratum
Content of cobbles: 0 to 5 percent throughout the profile

O horizon (if it occurs):
Hue—10YR, 7.5YR, 5YR, or N
Value—2 to 3
Chroma—0 to 2
Texture—sapric or hemic material

A horizon:
Hue—10YR, 7.5YR, or 5YR
Value—2 to 3
Chroma—1 or 2
Texture—silt loam

E horizon:
Hue—10YR or 7.5YR
Value—4 to 6
Chroma—2 or 3
Texture—silt loam or silt

Bs horizon:
Hue—7.5YR or 5YR
Value—3 or 4
Chroma—4
Texture—silt loam

E´ part of E/B and B/E horizons:
Hue—10YR, 7.5YR, or 5YR
Value—4 to 6
Chroma—2 or 3
Texture—silt loam or silt

Bt part of E/B and B/E horizons:
Hue—7.5YR or 5YR
Value—4
Chroma—4
Texture—silt loam

2Bt horizon:
Hue—10YR, 7.5YR, or 5YR
Value—4 to 6
Chroma—4 or 6
Texture—sandy loam, loam, loamy sand, or the gravelly or very gravelly analogs of these textures

3C horizon:
Hue—10YR, 7.5YR, or 5YR
Value—4 to 6
Chroma—3 to 6
Texture—stratified sand, coarse sand, or the gravelly or very gravelly analogs of these textures

Vilas Series

Depth class: Very deep
Drainage class: Excessively drained
Permeability: Rapid
Landform: Outwash plains, stream terraces, eskers, and kames
Parent material: Sandy glacial outwash
Slope range: 0 to 35 percent

Taxonomic classification: Sandy, mixed, frigid Entic Haplorthods

Typical Pedon

Vilas loamy sand (fig. 27), in an area of Pence-Vilas complex, 0 to 6 percent slopes, approximately 500 feet east and 800 feet south of the northwest corner of sec. 18, T. 38 N., R. 12 E.

A—0 to 3 inches; dark brown (7.5YR 3/2) loamy sand, brown (7.5YR 5/2) dry; weak fine granular structure; very friable; many very fine and fine roots; about 5 percent gravel; strongly acid; abrupt smooth boundary.
E—3 to 7 inches; brown (7.5YR 5/2) loamy sand, pinkish gray (7.5YR 6/2) dry; weak fine subangular blocky structure; very friable; common very fine and fine roots; about 5 percent gravel; moderately acid; abrupt wavy boundary.
Bs1—7 to 15 inches; dark brown (7.5YR 3/4) loamy sand; weak medium subangular blocky structure; very friable; few very fine and fine roots; about 5 percent gravel; moderately acid; clear wavy boundary.
Bs2—15 to 20 inches; brown (7.5YR 4/4) sand; weak medium subangular blocky structure; very friable; few very fine and fine roots; about 5 percent gravel; moderately acid; abrupt wavy boundary.
BC—20 to 29 inches; strong brown (7.5YR 4/6) sand; weak medium subangular blocky structure; very friable; about 5 percent gravel; slightly acid; clear wavy boundary.
C—29 to 60 inches; strong brown (7.5YR 4/6) sand; single grain; loose; about 5 percent gravel; slightly acid.

Range in Characteristics

Thickness of the loamy sand mantle: 10 to 20 inches
Thickness of the solum: 18 to 40 inches
Content of gravel: 0 to 15 percent throughout the profile

O horizon (if it occurs):
Hue—10YR, 7.5YR, 5YR, or N
Value—2 to 3
Chroma—0 to 2
Texture—sapric or hemic material

A horizon:
Hue—10YR, 7.5YR, 5YR, or N
Value—2 to 3
Chroma—0 to 3
Texture—loamy sand

E horizon:
Hue—7.5YR or 5YR
Value—4 or 5
Chroma—2
Texture—loamy sand

Bs horizon:
Hue—7.5YR or 5YR
Value—3 or 4
Chroma—4
Texture—loamy sand or sand

C horizon:
Hue—10YR, 7.5YR, or 5YR
Value—4 to 6
Chroma—4 or 6
Texture—sand

Wabeno Series

Depth class: Moderately deep to a fragipan
Drainage class: Moderately well drained
Permeability: Moderate in the upper part, slow in the fragipan, and moderate in the substratum
Landform: Drumlins and moraines
Parent material: Silty deposits underlain by sandy or loamy glacial till or glacial mudflow sediment
Slope range: 1 to 15 percent

Taxonomic classification: Coarse-loamy, mixed, frigid Oxyaquic Fragiorthods

Typical Pedon

Wabeno silt loam, in an area of Wabeno-Goodman silt loams, 6 to 15 percent slopes, very stony, approximately 2,200 feet west and 1,500 feet south of the northeast corner of sec. 22, T. 36 N., R. 12 E.

A—0 to 3 inches; dark brown (7.5YR 3/2) silt loam, pinkish gray (7.5YR 6/2) dry; weak fine granular structure; friable; many fine and common medium roots; about 5 percent gravel and 2 percent cobbles; moderately acid; abrupt smooth boundary.
E—3 to 6 inches; brown (7.5YR 5/2) silt loam, pinkish gray (7.5YR 7/2) dry; weak thin platy structure; friable; many fine and common medium roots; about 5 percent gravel and 2 percent cobbles; moderately acid; abrupt smooth boundary.
Bs1—6 to 8 inches; dark reddish brown (5YR 3/4) silt loam; weak fine subangular blocky structure; friable; many fine and few medium roots; about 5 percent gravel and 2 percent cobbles; strongly acid; abrupt wavy boundary.
Bs2—8 to 13 inches; brown (7.5YR 4/4) silt loam; weak medium subangular blocky structure; friable; many fine and few medium roots; about 5 percent gravel and 2 percent cobbles; strongly acid; clear wavy boundary.
E/B—13 to 27 inches; 65 percent light brown (7.5YR 6/3) silt loam (E´), pink (7.5YR 7/3) dry; weak medium subangular blocky structure parting to weak thin platy; friable; tonguing into and surrounding remnants of brown (7.5YR 4/4) silt loam (Bt); moderate medium subangular blocky structure; friable; common fine and few medium roots; few faint dark brown (7.5YR 3/4) clay films on faces of peds; about 5 percent gravel and 2 percent cobbles; strongly acid; clear wavy boundary.
2Btx—27 to 35 inches; brown (7.5YR 4/4) sandy loam; weak coarse subangular blocky structure; firm; brittle; few fine roots; few faint dark brown (7.5YR 3/4) clay films on faces of peds; few fine faint brown (7.5YR 5/4) masses of iron accumulation; about 8 percent gravel and 4 percent cobbles; moderately acid; clear wavy boundary.
2BCx—35 to 47 inches; strong brown (7.5YR 4/6) sandy loam; weak coarse subangular blocky structure; firm; slightly brittle; few fine roots; common fine distinct brown (7.5YR 5/4) masses of iron accumulation; about 8 percent gravel and 4 percent cobbles; moderately acid; gradual wavy boundary.
2C—47 to 60 inches; brown (7.5YR 4/4) sandy loam that has strata of brown (7.5YR 5/4) loamy sand 1/2 inch to 2 inches thick; massive; friable; about 8 percent gravel and 4 percent cobbles; slightly acid.

Range in Characteristics

Thickness of the solum: 35 to more than 60 inches
Thickness of the silty mantle: 12 to 36 inches
Depth to the fragipan: 20 to 40 inches
Content of gravel: 0 to 10 percent in the upper part of the solum; 5 to 25 percent in the lower part of the solum and in the substratum
Content of cobbles: 0 to 10 percent in the upper part of the solum; 0 to 20 percent in the lower part of the solum and in the substratum
Content of stones: 0 to 5 percent throughout the profile
Percent of surface covered by stones: 0.1 to 3.0

O horizon (if it occurs):
Hue—10YR, 7.5YR, 5YR, or N
Value—2 to 3
Chroma—0 to 2
Texture—sapric or hemic material

A horizon:
Hue—10YR, 7.5YR, or 5YR
Value—2 to 3
Chroma—1 or 2
Texture—silt loam

E horizon:
Hue—10YR, 7.5YR, or 5YR
Value—4 to 6
Chroma—2 or 3
Texture—silt loam or silt

Bs horizon:
Hue—7.5YR or 5YR
Value—3 or 4
Chroma—4
Texture—silt loam

E´ part of E/B horizon:
Hue—10YR or 7.5YR
Value—4 to 6
Chroma—2 or 3
Texture—silt loam or silt

Bt part of E/B horizon:
Hue—10YR or 7.5YR
Value—3 or 4
Chroma—4 or 6
Texture—silt loam

2Btx horizon:
Hue—10YR or 7.5YR
Value—3 to 6
Chroma—4 or 6
Texture—sandy loam, loam, or the gravelly or cobbly analogs of these textures

2C horizon:
Hue—10YR or 7.5YR
Value—3 to 6
Chroma—4 or 6
Texture—loamy sand, sandy loam, or the gravelly or cobbly analogs of these textures

Whisklake Series

Depth class: Very deep
Drainage class: Somewhat poorly drained
Permeability: Moderate in the solum and rapid or very rapid in the substratum
Landform: Outwash plains and stream terraces
Parent material: Primarily silty deposits underlain by sandy or sandy and gravelly glacial outwash
Slope range: 0 to 3 percent

Taxonomic classification: Coarse-loamy over sandy or sandy-skeletal, mixed, frigid Argic Endoaquods

Typical Pedon

Whisklake silt loam, 0 to 3 percent slopes, approximately 2,390 feet north and 1,265 feet east of the southwest corner of sec. 1, T. 36 N., R. 13 E.

A—0 to 3 inches; dark brown (10YR 3/3) silt loam, light brownish gray (10YR 6/2) dry; weak medium granular structure; friable; many fine and common medium roots; strongly acid; abrupt smooth boundary.

E—3 to 6 inches; brown (10YR 5/3) silt loam, very pale brown (10YR 7/3) dry; weak medium subangular blocky structure parting to weak medium platy; very friable; many fine and common medium roots; strongly acid; abrupt wavy boundary.

Bs—6 to 14 inches; brown (7.5YR 4/4) silt loam; weak medium subangular blocky structure; friable; common fine and few medium roots; few medium distinct strong brown (7.5YR 5/6) masses of iron accumulation; about 1 percent gravel; strongly acid; abrupt wavy boundary.

E´—14 to 17 inches; brown (10YR 5/3) silt loam, very pale brown (10YR 7/3) dry; weak medium subangular blocky structure parting to weak thin platy; very friable; common fine and few medium roots; common medium prominent strong brown (7.5YR 5/8) masses of iron accumulation; about 2 percent gravel; very strongly acid; clear wavy boundary.

2B/E—17 to 30 inches; 65 percent yellowish brown (10YR 5/4) loam (Bt); weak medium subangular blocky structure; friable; few faint dark yellowish brown (10YR 4/4) clay films on faces of peds; penetrated by tongues of pale brown (10YR 6/3) loam (E´), very pale brown (10YR 7/3) dry; weak medium subangular blocky structure; friable; few fine roots; common fine prominent strong brown (7.5YR 5/8) masses of iron accumulation; about 2 percent gravel; very strongly acid; clear wavy boundary.

2Bt—30 to 36 inches; yellowish brown (10YR 5/4) loam; weak medium subangular blocky structure; friable; few fine roots; few faint dark yellowish brown (10YR 4/4) clay films on faces of peds; common fine prominent strong brown (7.5YR 5/6) masses of iron accumulation and few fine distinct grayish brown (10YR 5/2) iron depletions; about 5 percent gravel; strongly acid; clear wavy boundary.

3C—36 to 60 inches; yellowish brown (10YR 5/4), stratified sand and very gravelly sand; single grain; loose; few fine distinct dark yellowish brown (10YR 4/6) masses of iron accumulation; about 30 percent gravel; slightly acid.

Range in Characteristics

Thickness of the solum: 20 to 40 inches
Thickness of the silty mantle: 12 to 40 inches
Content of gravel: 0 to 10 percent in the upper part of the solum; 0 to 35 percent in the lower part of the solum; 3 to 50 percent in the substratum
Content of cobbles: 0 to 5 percent throughout the profile

O horizon (if it occurs):
Hue—10YR, 7.5YR, or N
Value—2 to 3
Chroma—0 to 2
Texture—sapric or hemic material

A horizon:
Hue—10YR, 7.5YR, 5YR, or N
Value—2 to 3
Chroma—0 to 3
Texture—silt loam

E horizon:
Hue—10YR, 7.5YR, or 5YR
Value—5 or 6
Chroma—2 or 3
Texture—silt loam or silt

Bs horizon:
Hue—7.5YR or 5YR
Value—3 or 4
Chroma—4
Texture—silt loam

E´ horizon and E´ part of B/E horizon:
Hue—10YR or 7.5YR
Value—5 or 6
Chroma—2 or 3
Texture—silt loam or silt

Bt part of B/E horizon:
Hue—10YR or 7.5YR
Value—4 or 5
Chroma—4 or 6
Texture—silt loam

2Bt horizon:
Hue—10YR, 7.5YR, or 5YR
Value—4 or 5
Chroma—3 to 6
Texture—loam, sandy loam, or the gravelly or very gravelly analogs of these textures

3C horizon:
Hue—10YR, 7.5YR, or 5YR
Value—4 to 6
Chroma—3 to 6
Texture—stratified sand, coarse sand, or the gravelly or very gravelly analogs of these textures

Worcester Series

Depth class: Very deep
Drainage class: Somewhat poorly drained
Permeability: Moderate in the upper part and rapid or very rapid in the lower part
Landform: Outwash plains and stream terraces
Parent material: Primarily loamy deposits underlain by sandy or sandy and gravelly glacial outwash
Slope range: 0 to 3 percent

Taxonomic classification: Coarse-loamy, mixed, frigid Argic Endoaquods

Typical Pedon

Worcester sandy loam, 0 to 3 percent slopes, approximately 300 feet west and 900 feet north of the southeast corner of sec. 14, T. 37 N., R. 16 E.

A—0 to 2 inches; black (10YR 2/1) sandy loam, gray (10YR 5/1) dry; weak medium granular structure; very friable; many very fine and fine roots and few medium and coarse roots; about 1 percent gravel; very strongly acid; abrupt wavy boundary.
E—2 to 4 inches; brown (7.5YR 5/2) sandy loam, pinkish gray (7.5YR 7/2) dry; weak medium platy structure; friable; common very fine and fine roots and few medium and coarse roots; common fine prominent strong brown (7.5YR 5/8) masses of iron accumulation; about 1 percent gravel; very strongly acid; abrupt wavy boundary.
Bs1—4 to 8 inches; dark brown (7.5YR 3/4) sandy loam; moderate medium subangular blocky structure; friable; few very fine and fine roots; common fine prominent strong brown (7.5YR 5/8) masses of iron accumulation; about 2 percent gravel; very strongly acid; clear wavy boundary.
Bs2—8 to 19 inches; brown (7.5YR 4/4) sandy loam; weak medium subangular blocky structure; friable; few very fine and fine roots; common fine prominent strong brown (7.5YR 5/8) masses of iron accumulation; about 2 percent gravel; strongly acid; clear wavy boundary.
B/E—19 to 34 inches; 65 percent brown (7.5YR 4/4) sandy loam (Bt); moderate medium subangular blocky structure; friable; common faint dark brown (7.5YR 3/4) clay films on faces of peds; penetrated by tongues of brown (10YR 5/3) sandy loam (E´), very pale brown (10YR 7/3) dry; moderate medium subangular blocky structure; friable; many medium distinct and prominent

strong brown (7.5YR 5/8) masses of iron accumulation and many fine and medium prominent and faint grayish brown (10YR 5/2) iron depletions; about 2 percent gravel; strongly acid; clear wavy boundary.

2Bt—34 to 39 inches; brown (7.5YR 4/4) loamy sand; weak medium subangular blocky structure; very friable; common faint dark brown (7.5YR 3/4) clay bridging between sand grains; many fine and medium distinct strong brown (7.5YR 5/6) masses of iron accumulation and common fine and medium prominent grayish brown (10YR 5/2) iron depletions; about 5 percent gravel; moderately acid; clear wavy boundary.

2C—39 to 60 inches; dark yellowish brown (10YR 4/4), stratified sand and gravelly sand; single grain; loose; many fine and medium prominent strong brown (7.5YR 5/8) masses of iron accumulation; about 15 percent gravel; moderately acid.

Range in Characteristics

Thickness of the solum: 24 to 40 inches
Thickness of the loamy mantle: 24 to 40 inches
Content of gravel: 0 to 15 percent in the upper part of the solum; 3 to 50 percent in the lower part of the solum and in the substratum
Content of cobbles: 0 to 5 percent throughout the profile

O horizon (if it occurs):
Hue—10YR, 7.5YR, or N
Value—2 to 3
Chroma—0 to 2
Texture—sapric or hemic material

A horizon:
Hue—10YR, 7.5YR, 5YR, or N
Value—2 to 3
Chroma—0 to 3
Texture—sandy loam

E horizon:
Hue—10YR, 7.5YR, or 5YR
Value—4 to 6
Chroma—2 or 3
Texture—sandy loam

Bs horizon:
Hue—7.5YR or 5YR
Value—3 or 4
Chroma—4
Texture—sandy loam

E´ part of B/E horizon:
Hue—10YR or 7.5YR
Value—4 to 6
Chroma—2 or 3
Texture—sandy loam, fine sandy loam, or loamy sand

Bt part of B/E horizon:
Hue—10YR, 7.5YR, or 5YR
Value—4 to 6
Chroma—3 to 6
Texture—sandy loam, fine sandy loam, loam, or the gravelly analogs of these textures

2Bt horizon:
Hue—10YR, 7.5YR, or 5YR
Value—3 to 6
Chroma—4 or 6
Texture—loamy sand, loamy coarse sand, or the gravelly or very gravelly analogs of these textures

2C horizon:
Hue—10YR, 7.5YR, or 5YR
Value—4 to 6
Chroma—3 to 6
Texture—stratified sand, coarse sand, or the gravelly or very gravelly analogs of these textures

Wormet Series

Depth class: Very deep
Drainage class: Somewhat poorly drained
Permeability: Moderate or moderately rapid in the upper part and rapid or very rapid in the lower part
Landform: Outwash plains and stream terraces
Parent material: Primarily loamy deposits underlain by sandy or sandy and gravelly glacial outwash
Slope range: 0 to 3 percent

Taxonomic classification: Sandy, mixed, frigid Typic Endoaquods

Typical Pedon

Wormet sandy loam, 0 to 3 percent slopes, approximately 1,670 feet north and 2,505 feet west of the southeast corner of sec. 19, T. 36 N., R. 12 E.

Oe—0 to 1 inch; mucky peat (hemic material, which is a mat of partially decomposed forest litter), black (N 2.5/0) broken face and rubbed; about 35 percent fiber, 20 percent rubbed; weak medium platy structure; very friable; many very fine and fine roots and common medium roots; moderately acid (pH 6.0 in water 1:1); abrupt smooth boundary.

E—1 to 5 inches; brown (7.5YR 4/2) sandy loam, pinkish gray (7.5YR 6/2) dry; weak medium

subangular blocky structure; very friable; many very fine and fine roots and common medium roots; very strongly acid; abrupt wavy boundary.

Bs1—5 to 9 inches; dark brown (7.5YR 3/4) sandy loam; weak medium subangular blocky structure; very friable; many very fine and fine roots and common medium roots; very strongly acid; clear wavy boundary.

Bs2—9 to 18 inches; brown (7.5YR 4/4) sandy loam; weak medium subangular blocky structure; very friable; common very fine and fine roots and few medium roots; common medium distinct strong brown (7.5YR 5/6) masses of iron accumulation; very strongly acid; clear wavy boundary.

2C1—18 to 38 inches; strong brown (7.5YR 5/6) gravelly sand; single grain; loose; few very fine and fine roots; common coarse distinct strong brown (7.5YR 5/8) masses of iron accumulation; about 15 percent gravel; strongly acid; gradual wavy boundary.

2C2—38 to 61 inches; brown (7.5YR 5/4) sand; single grain; loose; few coarse distinct strong brown (7.5YR 5/6) masses of iron accumulation; about 5 percent gravel; strongly acid.

Range in Characteristics

Thickness of the solum: 15 to 36 inches

Thickness of the loamy mantle: 10 to 20 inches

Content of gravel: 0 to 35 percent in the solum; 3 to 35 percent in the substratum

Content of cobbles: 0 to 5 percent throughout the profile

Note: Unless otherwise stated, depths and thicknesses are measured from the top of the mineral soil.

O horizon:
- Hue—10YR, 7.5YR, 5YR, or N
- Value—2 to 3
- Chroma—0 to 2
- Texture—hemic or sapric material

A horizon (if it occurs):
- Hue—10YR, 7.5YR, or 5YR
- Value—2 to 3
- Chroma—1 or 2
- Texture—sandy loam

E horizon:
- Hue—7.5YR or 5YR
- Value—4 to 6
- Chroma—2 or 3
- Texture—sandy loam

Bs horizon:
- Hue—7.5YR or 5YR
- Value—3 or 4
- Chroma—4
- Texture—sandy loam or gravelly sandy loam

2C horizon:
- Hue—10YR, 7.5YR, or 5YR
- Value—4 or 5
- Chroma—4 or 6
- Texture—stratified sand, coarse sand, or the gravelly analogs of these textures

Formation of the Soils

This section describes the geology and underlying material in Forest County, relates the factors of soil formation to the soils in the county, and explains the processes of soil formation.

Geology and Underlying Material

Forest County is underlain by middle Precambrian igneous and metamorphic bedrock that makes up the southern extension of the Canadian Shield. The bedrock surface is irregular throughout the county and slopes generally to the east and southeast. The extreme northwest part of the county near the Michigan border is underlain by metavolcanic and metasedimentary rock and an iron formation. Gneiss underlies the central section along with small areas of dioritic intrusive rock in areas west of Cavour and near Atkins Lake. In the southwest corner (near Mole Lake) is a narrow area underlain by granite plutons. A significant sulfide deposit of zinc and copper is also in the southwestern part of the county, north of Little Sand Lake. Underlying the southeast corner is the Hager porphyry rock and a quartzite and conglomerate rock upland, which includes the prominent relief feature of McCaslin Mountain protruding through the glacial deposits. Bedrock exposed in other areas is typically located in topographic lows surrounded by glaciofluvial deposits, such as the gneiss outcrop on the south shore of Pine Lake. Four faults traverse Forest County in an east-west direction. The Niagara fault is in the north, two are near Newald and Cavour, and one is at the southern end of the county (Greenburg and Brown, 1984).

The Precambrian bedrock is overlain by as much as 300 feet of Pleistocene glacial sediment. The oldest glacial sediment includes the Marathon Formation of pre-Wisconsin age and the Lincoln Formation of early Wisconsin age. During the late Wisconsin age (12,000 to 22,000 years ago), the Horicon Formation of the Green Bay Lobe was deposited and then overlain by the Copper Falls Formation of the Langlade Lobe (Simpkins and others, 1987). Both lobes were part of the Laurentide Ice Sheet. Glacial sediment of the Green Bay Lobe is exposed in a few pits throughout most of Forest County. This sediment can be differentiated from deposits of the Langlade Lobe by the dominant presence of dolomite pebbles, the calcareous material, and an orientation of the till fabric indicating an ice flow to the northwest (Simpkins and others, 1987).

The Langlade Lobe was the latest advance of glacial ice that moved over the survey area from northeast to southwest. Evidence of this ice movement is the general orientation of drumlins, the long axis of which is parallel to the ice flow. These drumlin features cover a large portion of the county. They are cored with sand and gravel that have been overlain by glacial mudflow sediment. Another feature left by the Langlade Lobe is the Laona moraine, which is just north of Laona. This moraine is composed mostly of hummocky sand, gravel, and mudflow sediments. Throughout the county are areas of pitted and hummocky sand and gravel deposits. These deposits formed when glacial mudflow sediment flowed into adjacent low areas, which are now hills, from the debris-rich ice that was occupying what is now the adjacent low areas (Attig and Hvizdak, 1991).

Scattered throughout other parts of Forest County are unpitted plains and fans of stratified sand and gravel deposited by meltwater streams. Eskers and esker-like ridges also occur in the county and tend to be oriented northeast to southwest. Eskers are the result of well sorted sand and gravel deposited by meltwater in subglacial tunnels within the ice. Many eskers contain large stones and boulders, which suggest that the meltwater was moving at a high velocity. Stratified sandy, loamy, and silty lacustrine material was deposited in small glacial lakes that are presently adjacent to lakes and organic deposits. The organic deposits, some of which are vast, occur over large portions of the county. These deposits range from a few inches to more than 20 feet in thickness.

Factors of Soil Formation

Soil forms through processes that act on deposited or accumulated geologic material. The characteristics of the soil at any given point are determined by the physical and mineralogical composition of the parent

material; the climate under which the soil formed; the plant and animal life on and in the soil; the relief, or lay of the land, and drainage; and the length of time that the forces of soil formation have acted on the soil material.

Climate and plant and animal life, chiefly plants, are the active factors of soil formation. They act on the parent material that has accumulated through the weathering or physical disintegration of rocks and slowly change it into a natural body that has genetically related horizons. Relief conditions the effects of climate and plant and animal life. The parent material affects the kind of soil profile that forms and in some areas determines it almost entirely. Finally, time is needed for the transformation of the parent material into a soil. Some time is always required for the differentiation of soil horizons. Usually, a long time is required for the development of distinct horizons.

The factors of soil formation are so closely interrelated in their effects on the soil that few generalizations can be made regarding the effects of any one factor unless conditions are specified for the other four.

Parent Material

Parent material is the unconsolidated mass in which a soil forms. It largely determines the chemical and mineralogical composition of the soil. In Forest County the rugged preglacial landscape consisted mainly of crystalline bedrock. Several glaciers, advancing from different directions, subsequently covered the county. Glacial deposits covered most of the bedrock formations.

The parent material of the soils in Forest County varies greatly, sometimes within small areas, depending on how the material was deposited. The glacier or meltwater from the glacier deposited most of the material. The subsequent actions of water and wind reworked and redeposited some of the material. The parent materials in Forest County are mainly glacial till or glacial mudflow sediment, glacial outwash, and lacustrine deposits, which in places are covered by a thin layer of silty or loamy windblown material. Some of the soils formed in more recent deposits of organic material or alluvium.

Glacial till in Forest County is unsorted, nonstratified glacial drift consisting of clay, silt, sand, gravel, cobbles, stones, and boulders transported and deposited by glacial ice. Glacial mudflow sediment is material that was let down from the ice surface and has undergone some flow or mass movement. Goodwit soils formed in silty deposits underlain by sandy or loamy glacial till or glacial mudflow sediment.

Glacial outwash was deposited by running water from melting glaciers. The size of the particles that make up outwash varies, depending on the speed of the stream of water that carried the material. As the swiftly flowing water slowed down, the coarser particles were deposited. The more slowly moving water could carry the finer particles, such as very fine sand and silt. Glacial outwash deposits generally occur as layers of particles of similar size. Au Gres and Vilas soils are examples of soils that formed in sandy glacial outwash.

Lacustrine deposits were deposited in still, or ponded, glacial meltwater. The coarser fragments had dropped out of the moving water as glacial outwash. Only the finer particles, such as very fine sand, silt, and clay, remained to settle out in the still water. Fence and Gastrow soils formed primarily in silty deposits underlain by stratified lacustrine deposits.

Alluvium is material recently deposited by the floodwater of present streams. It is the youngest parent material in Forest County. Its range in texture depends on the speed of the water from which it was deposited. The deposits of a swiftly moving stream are coarser textured than those of a sluggish stream. Fordum soils formed primarily in loamy alluvium underlain by sandy or sandy and gravelly deposits.

Organic material consists of deposits of plant remains. After the glaciers receded from Forest County, water stood in depressions. Grasses, reeds, sedges, and trees grew and died at the edges of these bodies of water, and their remains fell to the bottom. These bodies of water were eventually filled with organic material and thus developed into areas of peat. In some areas the peat subsequently decomposed to muck. In other areas it has changed little since deposition. Cathro soils formed in herbaceous organic material 16 to 51 inches thick over loamy or silty deposits. Loxley soils formed in sphagnum moss and herbaceous organic material more than 51 inches thick.

Climate

Climate affects soil formation through its effects on the moisture supply in the soil and on soil temperature. It affects the weathering of rocks and the alteration of the parent material through the mechanical action of freezing and thawing and the chemical action generated by the leaching of water.

Climate indirectly affects soil formation through its effects on plant and animal life. Climatic factors influence the rate of plant growth and thus also influence the accumulation of organic matter in the soil and the level of soil fertility.

Forest County has a cool, subhumid continental climate characteristic of the north-central part of the United States. Climatic differences within the county are too small to have resulted in major differences among the soils.

Plant and Animal Life

Plants have been the principal organisms influencing the soils in Forest County; however, bacteria, fungi, earthworms, and human activities have also been important. The chief contributions of plant and animal life are the addition of organic material and nitrogen to the soil, the translocation of plant nutrients from the lower to the upper layers, the transformation of litter into humus, and the mixing of the soil. The remains of plants and animals accumulate in the soil, decay, and eventually become organic matter. Most of the soils in Forest County formed under forest vegetation, which results in a light-colored soil that has a relatively low content of organic matter. Bacteria and other micro-organisms help to break down the organic matter so that it can be used by growing plants. Earthworms and decayed plant roots provide channels for the movement of air and water through the soil. Human activities have an important effect on soil formation because they disturb the natural soil-forming processes. The installation of drainage systems, land clearing, burning, and cultivation have, to various degrees, altered the soils in the county. Cultivation has also increased the hazard of erosion in some areas.

Relief and Drainage

Relief in Forest County is affected by geologic and hydrographic factors. Hills, valleys, terraces, and outwash plains formed as a result of rain, wind, rivers, glacial meltwater, and glacial deposition. Where bedrock is the controlling factor of the topography, the resistance of the underlying rock to weathering has determined the relief. Relief influences soil formation through its effect on the amount of precipitation absorbed by the soil, on the rate of erosion, and on the translocation of material in suspension or solution from one part of the profile to another. The steeper soils absorb less water than the less sloping soils because of a higher rate of runoff. Consequently, they typically are well drained, tend to have a thinner solum and less horizon development than the less sloping soils, and are more susceptible to erosion. The somewhat poorly drained soils commonly are less sloping than the well drained soils and are affected by a slower runoff rate, or they are lower on the landscape. They usually receive runoff from the adjacent uplands. The poorly drained soils are in low positions on the landscape where runoff is very slow or ponded. The surface layer of these soils generally is darker and thicker than that of the upland soils because the moisture content is more favorable for plant growth and for the accumulation of organic matter. Very poorly drained organic soils form in depressions, basins, and drainageways where runoff is ponded and decomposing plant residue accumulates to a depth of several feet.

The natural soil drainage classes in the county range from excessively drained to very poorly drained. Through its effect on aeration of the soil, drainage generally determines the color of the soil. Water and air move freely through well drained soils but slowly through very poorly drained soils. In well aerated soils, the iron and aluminum compounds that give most soils their color are brightly colored and oxidized. Poorly aerated soils are generally dull gray and mottled. Drainage characteristics generally are reflected by the kind, prominence, and color of mottles or gleying in the soil horizons. Well drained to excessively drained soils have no mottles. Examples are Goodman, Pelissier, and Rubicon soils. Moderately well drained soils, such as Argonne and Croswell soils, have bright colored mottles in the B horizon or the upper part of the C horizon. Au Gres, Gastrow, and Whisklake soils are somewhat poorly drained soils that have mottles in the upper part of the B horizon. Poorly drained soils, such as Capitola and Minocqua soils, have grayer colors in the upper part of the profile. Very poorly drained organic soils, such as Loxley and Lupton soils, formed in deposits of plant remains. The color these soils exhibit depends to a large extent on the kind of plants the organic material was derived from and the amount of decomposition that has taken place.

Time

The length of time required for the formation of a given soil depends on the other factors of soil formation. Most of the soils in Forest County formed in material deposited at about the time of the last glaciation. The well drained soils that formed in glacial till or glacial mudflow sediment have well defined horizons as the result of processes that have been active for thousands of years. In contrast, the soils that formed in recent alluvial sediments do not have distinct horizons because the soil material has not been in place long enough for the full effect of the soil-forming processes.

Processes of Soil Formation

Horizons are differentiated in a soil as a result of the action of certain basic soil-forming processes. These processes are gains, losses, transfers, and transformations, and they generally do not act alone. Some changes promote horizon differentiation, and others retard or offset it. The balance among the changes determines the nature of the soil at any given point.

The interaction among these soil-forming processes is evident in Stambaugh soils. These soils formed primarily in silty deposits underlain by sandy and gravelly glacial outwash. The climate of Forest County favored the growth of plants. Plants and animals contribute to the accumulation of organic matter and organic acids, and they mixed the soil to some extent. These processes accelerated as more and higher forms of organisms grew in the soil and produced more organic residue and acids. The decomposed organic matter darkened the surface layer of these soils.

While organic matter was being decomposed, minerals within the Stambaugh soils were being chemically weathered by organic acids. Also, iron was being oxidized. Percolating water then translocated the weathered minerals, oxidized iron, and some organic matter to the lower parts of the profile. The result was the formation of a thin, bleached, brown subsurface layer and a subsoil of accumulated darker minerals.

The percolating water also translocated suspended particles of clay downward. As a result, the lower part of the subsoil has more clay than other parts of the profile. The underlying glacial outwash, which typically is at a depth of about 35 inches, is unweathered. It has changed little since it was deposited.

The processes that were active in the formation of the Stambaugh soils were gains in the organic matter content of the surface layer, loss of weathered minerals and clay from the upper part of the soil and the subsequent transfer of these substances to the upper and lower parts of the subsoil, and the transformation of iron compounds in the subsoil. All of these processes have been active in the soils of Forest County. The kinds of parent material and the relief have determined to a great extent the kinds of processes that are dominant in the formation of all the soils. These processes, in turn, largely determine the differences and similarities among the soils.

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Glossary

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Alpha,alpha-dipyridyl. A dye that when dissolved in 1N ammonium acetate is used to detect the presence of reduced iron (Fe II) in the soil. A positive reaction indicates a type of redoximorphic feature.

Animal unit month (AUM). The amount of forage required by one mature cow of approximately 1,000 pounds weight, with or without a calf, for 1 month.

Aquic conditions. Current soil wetness characterized by saturation, reduction, and redoximorphic features.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as:

Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	more than 12

Backslope. The position that forms the steepest and generally linear, middle portion of a hillslope. In profile, backslopes are commonly bounded by a convex shoulder above and a concave footslope below.

Base saturation. The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, and K), expressed as a percentage of the total cation-exchange capacity.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bedrock-controlled topography. A landscape where the configuration and relief of the landforms are determined or strongly influenced by the underlying bedrock.

Board foot. A unit of measurement represented by a board 1 foot wide, 1 foot long, and 1 inch thick.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Canopy. The leafy crown of trees or shrubs. (See Crown.)

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.

Chiseling. Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard, compacted layers to a depth below normal plow depth.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay depletions. Low-chroma zones having a low content of iron, manganese, and clay because of the chemical reduction of iron and manganese and the removal of iron, manganese, and clay. A type of redoximorphic depletion.

Clayey. General term for the soil textural classes clay, silty clay, and sandy clay.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Clearcutting. The removal of all the timber in a stand when trees are harvested.

Climax plant community. The stabilized plant

community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

Coarse textured soil. Sand or loamy sand.

Cobble (or cobblestone). A rounded or partly rounded fragment of rock 3 to 10 inches (7.6 to 25 centimeters) in diameter.

Cobbly soil material. Material that has 15 to 35 percent, by volume, rounded or partially rounded rock fragments 3 to 10 inches (7.6 to 25 centimeters) in diameter. Very cobbly soil material has 35 to 60 percent of these rock fragments, and extremely cobbly soil material has more than 60 percent.

Complex slope. Irregular or variable slope. Planning or establishing terraces, diversions, and other water-control structures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil or miscellaneous areas in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas.

Concretions. Cemented bodies with crude internal symmetry organized around a point, a line, or a plane. They typically take the form of concentric layers visible to the naked eye. Calcium carbonate, iron oxide, and manganese oxide are common compounds making up concretions. If formed in place, concretions of iron oxide or manganese oxide are generally considered a type of redoximorphic concentration.

Conservation cropping system. Growing crops in combination with needed cultural and management practices. In a good conservation cropping system, the soil-improving crops and practices more than offset the effects of the soil-depleting crops and practices. Cropping systems are needed on all tilled soils. Soil-improving practices in a conservation cropping system include the use of rotations that contain grasses and legumes and the return of crop residue to the soil. Other practices include the use of green manure crops of grasses and legumes, proper tillage, adequate fertilization, and weed and pest control.

Conservation tillage. A tillage system that does not invert the soil and that leaves a protective amount of crop residue on the surface throughout the year.

Consistence, soil. Refers to the degree of cohesion and adhesion of soil material and its resistance to deformation when ruptured. Consistence includes resistance of soil material to rupture and to penetration; plasticity, toughness, and stickiness of puddled soil material; and the manner in which the soil material behaves when subject to compression. Terms describing consistence are defined in the "Soil Survey Manual."

Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Cord. A unit of measurement of stacked wood. A standard cord occupies 128 cubic feet with dimensions of 4 feet by 4 feet by 8 feet.

Corrosion. Soil-induced electrochemical or chemical action that dissolves or weakens concrete or uncoated steel.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cradle-knoll. A small mound made up of soil material that temporarily clung to the roots when a tree was uprooted.

Critical-area planting. Planting stabilizing vegetation in highly erodible or critically eroding areas. The areas typically cannot be stabilized by ordinary conservation treatment and management, and leaving them untreated can result in severe erosion or in damage from sediment.

Cropping system. Growing crops according to a planned system of rotation and management practices.

Crop residue management. Returning crop residue to the soil, which helps to maintain soil structure, organic matter content, and fertility and helps to control erosion.

Crown. The upper part of a tree or shrub, including the living branches and their foliage.

Culmination of the mean annual increment (CMAI). The average annual increase per acre in the volume of a stand. Computed by dividing the total volume of the stand by its age. As the stand increases in age, the mean annual increment continues to increase until mortality begins to reduce the rate of increase. The point where the stand reaches its maximum annual rate of growth is called the culmination of the mean annual increment.

Cut area. A special symbol used on the soil maps to indicate a small area where the soil has been altered by the removal of more than about a foot of soil material.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Decreasers. The most heavily grazed climax range plants. Because they are the most palatable, they are the first to be destroyed by overgrazing.

Deep to water (in tables). The soil is deep to a permanent water table (typically more than 5 feet) during the dry season.

Deferred grazing. Postponing grazing or resting grazing land for a prescribed period.

Depression, closed. A special symbol used on the soil maps to indicate a small, concave area the middle of which is generally at least 5 feet lower in elevation than the surrounding map unit.

Depth, soil. Generally, the thickness of the soil over bedrock. Very deep soils are more than 60 inches deep over bedrock; deep soils, 40 to 60 inches; moderately deep, 20 to 40 inches; shallow, 10 to 20 inches; and very shallow, less than 10 inches.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of wet periods under conditions similar to those under which the soil formed. Alterations of the water regime by human activities, either through drainage or irrigation, are not a consideration unless they have significantly changed the morphology of the soil. Seven classes of natural soil drainage are recognized—*excessively drained, somewhat excessively drained, well drained, moderately well drained, somewhat poorly drained, poorly drained,* and *very poorly drained*. These classes are defined in the "Soil Survey Manual."

Drainage, surface. Runoff, or surface flow of water, from an area.

Droughty (in tables). The soil holds too little water for plants during dry periods.

Drumlin. A low, smooth, elongated oval hill, mound, or ridge of compact glacial till. The longer axis is parallel to the path of the glacier and commonly has a blunt nose pointing in the direction from which the ice approached.

Dry spot. A special symbol used on the soil maps to indicate a small area of mineral soil within an area of organic soils.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Endosaturation. A type of saturation of the soil in which all horizons between the upper boundary of saturation and a depth of 2 meters are saturated.

Episaturation. A type of saturation indicating a perched water table in a soil in which saturated layers are underlain by one or more unsaturated layers within 2 meters of the surface.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of human or animal activities or of a catastrophe in nature, such as a fire, that exposes the surface.

Esker. A narrow, winding ridge of stratified gravelly and sandy drift deposited by a stream flowing in a tunnel beneath a glacier.

Eutrophication. The aging process of lakes in which aquatic plants become abundant and waters become deficient in oxygen. The process is usually accelerated by enrichment of waters with surface runoff containing nitrogen and phosphorus.

Excess fines (in tables). Excess silt and clay in the soil. The soil does not provide a source of gravel or sand for construction purposes.

Fast intake (in tables). The rapid movement of water into the soil.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fibric soil material (peat). The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

Field border. A strip of perennial vegetation established at the edge of a field.

Field windbreak. A strip of trees or shrubs established within or adjacent to a field.

Fill area. A special symbol used on the soil maps to

indicate a small area covered with 1 foot to several feet of graded or filled soil material.

Fine textured soil. Sandy clay, silty clay, or clay.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Footslope. The position that forms the inner, gently inclined surface at the base of a hillslope. In profile, footslopes are commonly concave. A footslope is a transition zone between upslope sites of erosion and transport (shoulders and backslopes) and downslope sites of deposition (toeslopes).

Forb. Any herbaceous plant not a grass or a sedge.

Forest cover. All trees and other woody plants (underbrush) covering the ground in a forest.

Forest cover type. The dominant tree species in a tract of forest land.

Forest habitat type. An association of dominant trees and ground flora species in a climax plant community.

Fragipan. A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Glacial drift. Pulverized and other rock material transported by glacial ice and then deposited. Also, the sorted and unsorted material deposited by streams flowing from glaciers.

Glacial mudflow sediment (geology). Clay, silt, sand, gravel, cobbles, stones, and boulders that were let down from the surface of glacial ice and have undergone some flow or mass movement.

Glacial outwash. Gravel, sand, and silt, commonly stratified, deposited by glacial meltwater.

Glacial till. Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock as much as 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that has 15 to 35 percent, by volume, rounded or angular rock fragments, not prominently flattened, as much as 3 inches (7.6 centimeters) in diameter.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water. Water filling all the unblocked pores of the material below the water table.

Hard bedrock. Bedrock that cannot be excavated except by blasting or by the use of special equipment that is not commonly used in construction.

Head slope. A geomorphic component of hills consisting of a laterally concave area of a hillside, especially at the head of a drainageway. The overland waterflow is converging.

Hemic soil material (mucky peat). Organic soil material intermediate in degree of decomposition between the less decomposed fibric material and the more decomposed sapric material.

High-chroma zones. Zones having chroma of 3 or more. Typical color in areas of iron accumulations.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the "Soil Survey Manual." The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying soil material. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

Cr horizon.—Soft, consolidated bedrock beneath the soil.

R layer.—Consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon, but it can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff potential. The soil properties that influence this potential are those that affect the minimum rate of water infiltration on a bare soil during periods after prolonged wetting when the soil is not frozen. These properties are depth to a seasonal high water table, the infiltration rate and permeability after prolonged wetting, and depth to a very slowly permeable layer. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff.

Igneous rock. Rock formed by solidification from a molten or partially molten state. Major varieties include plutonic and volcanic rock. Examples are andesite, basalt, and granite.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Increasers. Species in the climax vegetation that increase in amount as the more desirable plants are reduced by close grazing. Increasers commonly are the shorter plants and the less palatable to livestock.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Interfluve. An elevated area between two drainageways that sheds water to those drainageways.

Iron accumulations. High-chroma zones having a high content of iron and manganese oxide but having a clay content similar to that of the adjacent matrix.

Iron depletions. Low-chroma zones having a low content of iron and manganese oxide because of chemical reduction and removal but having a clay content similar to that of the adjacent matrix. A type of redoximorphic depletion.

Irrigation. Application of water to soils to assist in production of crops.

Kame. An irregular, short ridge or hill of stratified glacial drift.

Knoll. A small, low, rounded hill rising above adjacent landforms.

K_{sat}. Saturated hydraulic conductivity. (See Permeability.)

Lacustrine deposit. Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Large stones (in tables). Rock fragments 3 inches (7.6 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loamy. General term for the soil textural classes very fine sandy loam, fine sandy loam, sandy loam, coarse sandy loam, loam, clay loam, and sandy clay loam.

Low-chroma zones. Zones having chroma of 2 or less. Typical color in areas of iron depletions.

Low strength. The soil is not strong enough to support loads.

Masses. Concentrations of substances in the soil matrix that do not have a clearly defined boundary with the surrounding soil material and cannot be removed as a discrete unit. Common compounds making up masses are calcium carbonate, gypsum or other soluble salts, iron oxide, and manganese oxide. Masses consisting of iron oxide or manganese oxide generally are considered a type of redoximorphic concentration.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Metamorphic rock. Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement. Nearly all such rocks are crystalline.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Coarse sandy loam, sandy loam, or fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, or silty clay loam.

Mollic epipedon. A thick, dark, humus-rich surface horizon (or horizons) that has high base saturation and pedogenic soil structure. It may include the upper part of the subsoil.

Moraine. An accumulation of earth, stones, and other debris deposited by a glacier. Some types are terminal, lateral, medial, and ground.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Descriptive terms are as follows: abundance—*few, common,* and *many;* size—*fine, medium,* and *coarse;* and contrast—*faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium,* from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse,* more than 15 millimeters (about 0.6 inch).

Muck. Dark, finely divided, well decomposed organic soil material. (See Sapric soil material.)

Munsell notation. A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with hue of 10YR, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value of 6.6 to 7.3. (See Reaction, soil.)

Nodules. Cemented bodies lacking visible internal structure. Calcium carbonate, iron oxide, and manganese oxide are common compounds making up nodules. If formed in place, nodules of iron oxide or manganese oxide are considered types of redoximorphic concentrations.

Nose slope. A geomorphic component of hills consisting of the projecting end (laterally convex area) of a hillside. The overland waterflow is predominantly divergent.

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter. Plant and animal residue in the soil in various stages of decomposition. The content of organic matter in the surface layer is described as follows:

Very low	less than 0.5 percent
Low	0.5 to 1.0 percent
Moderately low	1.0 to 2.0 percent
Moderate	2.0 to 4.0 percent
High	4.0 to 8.0 percent
Very high	more than 8.0 percent

Organic soil. A soil that contains 12 percent to more than 18 percent organic carbon, depending on the content of mineral materials, and is 16 or more inches thick.

Outwash plain. A landform of mainly sandy or coarse textured material of glaciofluvial origin. An outwash plain is commonly smooth; where pitted, it generally is low in relief.

Paleoterrace. An erosional remnant of a terrace that retains the surface form and alluvial deposits of its origin but was not emplaced by, and commonly does not grade to, a present-day stream or drainage network.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Peat. Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture. (See Fibric soil material.)

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Perched water table. A water table that exists in the soil above an unsaturated zone.

Percolation. The movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil adversely affects the specified use.

Permeability. The quality of the soil that enables water

or air to move downward through the profile. The rate at which a saturated soil transmits water is accepted as a measure of this quality. In soil physics, the rate is referred to as "saturated hydraulic conductivity," which is defined in the "Soil Survey Manual." In line with conventional usage in the engineering profession and with traditional usage in published soil surveys, this rate of flow continues to be expressed as "permeability." Terms describing permeability, measured in inches per hour, are as follows:

Impermeable	less than 0.0015 inch
Very slow	0.0015 to 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management, such as slope, stoniness, and flooding.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Pitted outwash. An outwash area characterized by many irregular depressions, such as kettles, shallow pits, and potholes.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Poletimber. Hardwood trees ranging from 5 to 11 inches in diameter at breast height; coniferous trees ranging from 5 to 9 inches in diameter at breast height.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poor filter (in tables). Because of rapid or very rapid permeability, the soil may not adequately filter effluent from a waste disposal system.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Potential rooting depth (effective rooting depth). Depth to which roots could penetrate if the content of moisture in the soil were adequate. The soil has no properties restricting the penetration of roots to this depth.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are:

Ultra acid	less than 3.5
Extremely acid	3.5 to 4.4
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Moderately acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Slightly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Redoximorphic concentrations. Nodules, concretions, soft masses, pore linings, and other features resulting from the accumulation of iron or manganese oxide. An indication of chemical reduction and oxidation resulting from saturation.

Redoximorphic depletions. Low-chroma zones from which iron and manganese oxide or a combination of iron and manganese oxide and clay has been removed. These zones are indications of the chemical reduction of iron resulting from saturation.

Redoximorphic features. Redoximorphic concentrations, redoximorphic depletions, reduced matrices, a positive reaction to alpha,alpha-dipyridyl, and other features indicating the chemical reduction and oxidation of iron and manganese compounds resulting from saturation.

Reduced matrix. A soil matrix that has low chroma in situ because of chemically reduced iron (Fe II). The chemical reduction results from nearly continuous wetness. The matrix undergoes a change in hue or chroma within 30 minutes after exposure to air as the iron is oxidized (Fe III). A type of redoximorphic feature.

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rock outcrop. A special symbol used on the soil maps to indicate a small exposure of bedrock.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandy. General term for the soil textural classes loamy very fine sand, loamy fine sand, loamy sand, loamy coarse sand, very fine sand, fine sand, sand, and coarse sand.

Sapling. A tree ranging from 1 inch to 5 inches in diameter at breast height.

Sapric soil material (muck). The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

Saturation. Wetness characterized by zero or positive pressure of the soil water. Under conditions of saturation, the water will flow from the soil matrix into an unlined auger hole.

Sawtimber. Hardwood trees more than 11 inches in diameter at breast height; coniferous trees more than 9 inches in diameter at breast height.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Seedling. A tree less than 1 inch in diameter at breast height.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Sequum. A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shelterwood cut. A method of tree harvest in which enough large trees are left to protect the younger and shorter trees from windthrow and other damage.

Short steep slope. A special symbol used on the soil maps to indicate a narrow, elongated area in which the slope is at least two classes greater than that of the surrounding area.

Shoulder. The position that forms the uppermost inclined surface near the top of a hillslope. It is a transition from backslope to summit. The surface is dominantly convex in profile and erosional in origin.

Side slope. A geomorphic component of hills consisting of a laterally planar area of a hillside. The overland waterflow is predominantly parallel.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Silty. General term for the soil textural classes silt, silt loam, and silty clay loam.

Similar soils. Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the survey area.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance. In this survey, the slope classes are as follows:

Nearly level	0 to 2 percent
Gently sloping	2 to 6 percent
Sloping	6 to 15 percent
Moderately steep	15 to 25 percent
Steep	25 to 35 percent
Very steep	more than 35 percent

Slope (in tables). Slope is great enough that special

practices are required to ensure satisfactory performance of the soil for a specific use.

Small stones (in tables). Rock fragments less than 3 inches (7.6 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Sodium adsorption ratio (SAR). A measure of the amount of sodium (Na) relative to calcium (Ca) and magnesium (Mg) in the water extract from saturated soil paste. It is the ratio of the Na concentration divided by the square root of one-half of the Ca + Mg concentration.

Soft bedrock. Bedrock that can be excavated with trenching machines, backhoes, small rippers, and other equipment commonly used in construction.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief and by the passage of time.

Soil blowing (in tables). The soil is easily moved by the wind.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the material below the solum. The living roots and plant and animal activities are largely confined to the solum.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded or 15 to 24 inches (38 to 60 centimeters) in length if flat.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stripcropping. Growing crops in a systematic arrangement of strips or bands that provide vegetative barriers to soil blowing and water erosion.

Strip cut. A method of tree harvest in which the timber is clearcut in strips, commonly 50 to 100 feet wide.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grain* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Subsides (in tables). The settlement of organic soils or soils containing semifluid layers.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. The part of the soil below the solum.

Subsurface layer. Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Succession. The replacement of one plant community by another. Shade-tolerant plant species commonly replace shade-intolerant species.

Summit. The topographically highest position of a hillslope. It has a nearly level (planar or only slightly convex) surface.

Surface layer. The A and Ap horizons and those E, Oi, Oe, and Oa horizons that extend all the way to the land surface. The Oi, Oe, and Oa horizons in soils that are excessively drained, somewhat excessively drained, well drained, moderately well drained, or somewhat poorly drained are considered organic layers rather than surface layers.

Surface soil. The A, E, AB, and EB horizons, considered collectively. It includes all subdivisions of these horizons.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field generally is built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay*

loam, silty clay loam, sandy clay, silty clay, and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material that is too thin for the specified use.

Tiers. Layers used to define the control section in the classification of organic soils. The organic material is divided into three tiers. The surface tier is the upper 12 inches, the subsurface tier is the next 24 inches, and the bottom tier is the lower 16 inches.

Till plain. An extensive area of nearly level to undulating soils underlain by glacial till.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toeslope. The position that forms the gently inclined surface at the base of a hillslope. Toeslopes in profile are commonly gentle and linear and are constructional surfaces forming the lower part of a hillslope continuum that grades to valley or closed-depression floors.

Too sandy (in tables). The soil is soft and loose, droughty, and low in fertility.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Upland. Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically a sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Windthrow. The uprooting and tipping over of trees by the wind.

Tables

Table 1.--Temperature and Precipitation

(Recorded in the period 1952-83 at Laona, Wisconsin)

Month	Temperature						Precipitation				
				2 years in 10 will have--				2 years in 10 will have--			
	Average daily maximum	Average daily minimum	Average	Maximum temperature higher than--	Minimum temperature lower than--	Average number of growing degree days*	Average	Less than--	More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January----	20.7	0.7	10.7	42	-31	0	1.02	0.35	1.56	3	13.7
February---	26.4	4.0	15.2	49	-27	0	.86	.26	1.33	3	10.5
March------	37.0	14.1	25.6	60	-19	0	1.72	.59	2.64	5	12.0
April------	52.1	28.1	40.1	80	4	12	2.62	1.55	3.56	6	5.8
May--------	66.3	38.9	52.6	87	19	166	3.47	2.22	4.59	8	.7
June-------	73.7	48.0	60.9	89	28	332	3.56	2.01	4.93	8	.0
July-------	78.0	53.2	65.6	91	35	484	3.48	2.09	4.72	7	.0
August-----	75.2	51.5	63.4	89	31	415	4.03	2.24	5.61	8	.0
September--	65.7	43.8	54.8	84	24	160	4.02	2.21	5.60	8	.0
October----	55.6	34.7	45.2	78	13	67	2.29	1.14	3.31	5	1.0
November---	38.7	22.5	30.6	63	-7	0	1.81	.76	2.69	4	8.2
December---	25.4	8.6	17.0	47	-25	0	1.40	.70	2.01	5	15.0
Yearly:											
Average---	51.2	29.0	40.1	---	---	---	---	---	---	---	---
Extreme---	---	---	---	92	-32	---	---	---	---	---	---
Total-----	---	---	---	---	---	1,636	30.28	26.62	34.08	70	66.9

* A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (50 degrees F).

Table 2.--Freeze Dates in Spring and Fall

(Recorded in the period 1952-83 at Laona, Wisconsin)

Probability	Temperature		
	24 °F or lower	28 °F or lower	32 °F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	May 20	June 8	June 22
2 years in 10 later than--	May 16	June 3	June 16
5 years in 10 later than--	May 6	May 23	June 6
First freezing temperature in fall:			
1 year in 10 earlier than--	Sept. 18	Sept. 4	Aug. 8
2 years in 10 earlier than--	Sept. 24	Sept. 11	Aug. 17
5 years in 10 earlier than--	Oct. 7	Sept. 22	Sept. 4

Table 3.--Growing Season

(Recorded in the period 1952-83 at Laona, Wisconsin)

Probability	Daily minimum temperature during growing season		
	Higher than 24 °F	Higher than 28 °F	Higher than 32 °F
	Days	Days	Days
9 years in 10	126	94	58
8 years in 10	135	103	69
5 years in 10	153	121	90
2 years in 10	170	139	110
1 year in 10	180	149	121

Table 4.--Acreage and Proportionate Extent of the Soils

Map symbol	Soil name	Acres	Percent
ArB	Argonne-Sarwet sandy loams, 1 to 6 percent slopes, very stony	10,282	1.5
Au	Au Gres loamy sand, 0 to 2 percent slopes	1,047	0.2
Ca	Capitola muck, 0 to 2 percent slopes, very stony	5,682	0.8
CrA	Croswell loamy sand, 0 to 3 percent slopes	1,094	0.2
CuA	Cublake loamy sand, 0 to 3 percent slopes	814	0.1
FeB	Fence silt loam, 0 to 6 percent slopes	2,496	0.4
FlA	Flink loamy sand, 0 to 3 percent slopes	715	0.1
Fm	Fordum loam, 0 to 2 percent slopes	4,439	0.7
GaA	Gastrow silt loam, 0 to 3 percent slopes	2,483	0.4
Kr	Kinross muck, 0 to 2 percent slopes	868	0.1
LaC	Laona-Sarona sandy loams, 6 to 15 percent slopes, very stony	10,485	1.6
LaD	Laona-Sarona sandy loams, 15 to 35 percent slopes, very stony	4,064	0.6
Lo	Loxley, Beseman, and Dawson peats, 0 to 1 percent slopes	29,550	4.4
Lu	Lupton, Cathro, and Markey mucks, 0 to 1 percent slopes	121,045	18.1
M-W	Miscellaneous water	25	*
MaA	Manitowish sandy loam, 0 to 3 percent slopes	2,103	0.3
MeD	Metonga-Rock outcrop complex, 4 to 60 percent slopes, very stony	717	0.1
Mn	Minocqua muck, 0 to 2 percent slopes	8,208	1.2
MuB	Mudlake silt loam, 1 to 6 percent slopes, very stony	20,355	3.0
PaB	Padus sandy loam, 0 to 6 percent slopes	18,459	2.8
PaC	Padus sandy loam, 6 to 15 percent slopes	27,962	4.2
PaD	Padus sandy loam, 15 to 35 percent slopes	5,267	0.8
PeB	Padus-Pence sandy loams, 0 to 6 percent slopes	10,717	1.6
PeC	Padus-Pence sandy loams, 6 to 15 percent slopes	39,063	5.8
PeD	Padus-Pence sandy loams, 15 to 35 percent slopes	31,998	4.8
PfD	Padus-Soperton silt loams, 15 to 35 percent slopes, very stony	6,477	1.0
PgB	Padus-Wabeno silt loams, 1 to 6 percent slopes, very stony	11,703	1.7
PgC	Padus-Wabeno silt loams, 6 to 15 percent slopes, very stony	14,521	2.2
PhB	Padwood sandy loam, 0 to 6 percent slopes	3,956	0.6
PkE	Pelissier gravelly sandy loam, 20 to 45 percent slopes, stony	2,282	0.3
PnB	Pence sandy loam, 0 to 6 percent slopes	2,026	0.3
PnC	Pence sandy loam, 6 to 15 percent slopes	2,538	0.4
PnD	Pence sandy loam, 15 to 35 percent slopes	2,901	0.4
PsB	Pence-Vilas complex, 0 to 6 percent slopes	4,609	0.7
PsC	Pence-Vilas complex, 6 to 15 percent slopes	9,716	1.5
PsD	Pence-Vilas complex, 15 to 35 percent slopes	4,493	0.7
Pt	Pits, gravel	257	*
RuD	Rubicon loamy sand, 15 to 35 percent slopes	468	0.1
SoD	Soperton-Goodman silt loams, 15 to 35 percent slopes, very stony	13,878	2.1
SpD	Soperton-Mudlake silt loams, 1 to 35 percent slopes, very stony	530	0.1
StB	Stambaugh silt loam, 0 to 6 percent slopes	27,053	4.0
StC	Stambaugh silt loam, 6 to 15 percent slopes	30,570	4.6
StD	Stambaugh silt loam, 15 to 25 percent slopes	4,138	0.6
TpA	Tipler sandy loam, 0 to 3 percent slopes	11,819	1.8
VaB	Vanzile silt loam, 0 to 6 percent slopes	24,816	3.7
VsB	Vilas loamy sand, 0 to 6 percent slopes	733	0.1
VsC	Vilas loamy sand, 6 to 15 percent slopes	944	0.1
WaC	Wabeno-Goodman silt loams, 6 to 15 percent slopes, very stony	36,684	5.5
WbB	Wabeno-Goodwit silt loams, 1 to 6 percent slopes, very stony	48,269	7.2
WdB	Wabeno-Mudlake silt loams, 1 to 15 percent slopes, very stony	7,720	1.2
WhA	Whisklake silt loam, 0 to 3 percent slopes	7,796	1.2
WrA	Worcester sandy loam, 0 to 3 percent slopes	5,771	0.9
WtA	Wormet sandy loam, 0 to 3 percent slopes	865	0.1
W	Water	22,392	3.3
	Total	669,863	100.0

* Less than 0.05 percent.

Table 5.--Woodland Management and Productivity

(Only the soils suitable for the production of commercial trees are listed. See text for definitions of terms used in this table. Absence of an entry indicates that information was not available)

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Seedling mortality	Windthrow hazard	Plant competition	Common trees	Site index	Volume*	
ArB:									
Argonne	3L	Slight	Slight	Moderate	Moderate	Sugar maple	65	40	White spruce, red pine.
						American basswood	72	69	
						Yellow birch	70	43	
						White ash	76	75	
						Quaking aspen	---	---	
Sarwet	3L	Slight	Slight	Slight	Moderate	Sugar maple	64	40	Red pine, eastern white pine, white spruce.
						Northern red oak	72	69	
						American basswood	70	66	
						Quaking aspen	---	---	
						White ash	75	73	
						Eastern hemlock	---	---	
Au Au Gres	6W	Slight	Moderate	Severe	Severe	Quaking aspen	70	81	White spruce, red pine, eastern white pine.
						Bigtooth aspen	---	---	
						Balsam fir	---	---	
						Paper birch	---	---	
						Yellow birch	---	---	
						Red maple	65	40	
						Eastern hemlock	---	---	
						Eastern white pine	---	---	
						Northern whitecedar	---	---	
						Jack pine	51	69	
						Red pine	61	104	
						Northern red oak	---	---	
Ca Capitola	7W	Slight	Severe	Severe	Severe	Balsam fir	52	100	Balsam fir, red maple, white ash, black spruce, white spruce.
						Red maple	56	36	
						Black ash	48	32	
						Quaking aspen	---	---	
						Northern whitecedar	---	---	
						Tamarack	---	---	
						American elm	---	---	
						Eastern hemlock	---	---	
CrA Croswell	5S	Slight	Slight	Moderate	Moderate	Quaking aspen	68	78	Red pine, eastern white pine, white spruce.
						Red pine	55	88	
						Jack pine	53	73	
						Northern red oak	---	---	
						Black cherry	---	---	
						Eastern white pine	---	---	
						Bigtooth aspen	69	80	
						Red maple	---	---	
						Paper birch	54	55	
CuA Cublake	7S	Slight	Slight	Moderate	Moderate	Red pine	60	101	Red pine, eastern white pine, jack pine.
						Red maple	---	---	
						Northern red oak	---	---	
						Paper birch	---	---	
						Eastern white pine	---	---	
						Balsam fir	---	---	
						Quaking aspen	---	---	

See footnote at end of table.

Table 5.--Woodland Management and Productivity--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Seedling mortality	Windthrow hazard	Plant competition	Common trees	Site index	Volume*	
FeB---------- Fence	3L	Slight	Slight	Slight	Severe	Sugar maple---------	65	40	Red pine, eastern white pine, white spruce.
						Yellow birch--------	---	---	
						American basswood---	---	---	
						Quaking aspen-------	---	---	
						Bigtooth aspen------	---	---	
						Red maple-----------	---	---	
						Eastern hemlock-----	---	---	
						Balsam fir----------	---	---	
						Paper birch---------	---	---	
FlA---------- Flink	6W	Slight	Slight	Severe	Severe	Red pine-----------	56	90	Red pine, eastern white pine, white spruce.
						Balsam fir----------	---	---	
						Eastern white pine--	---	---	
						Paper birch---------	---	---	
						Red maple-----------	---	---	
						Quaking aspen-------	---	---	
Fm---------- Fordum	2W	Slight	Severe	Severe	Severe	Silver maple--------	80	34	Silver maple, red maple, white ash.
						Red maple-----------	---	---	
						White ash-----------	---	---	
						Northern whitecedar-	---	---	
						Tamarack------------	---	---	
						Black spruce--------	---	---	
						Balsam fir----------	---	---	
						White spruce--------	---	---	
GaA---------- Gastrow	3W	Slight	Moderate	Severe	Severe	Sugar maple---------	61	38	White spruce, eastern white pine, northern whitecedar.
						Red maple-----------	---	---	
						Yellow birch--------	---	---	
						Balsam fir----------	---	---	
						Paper birch---------	---	---	
						Eastern hemlock-----	---	---	
						Quaking aspen-------	---	---	
Kr---------- Kinross	2W	Slight	Severe	Severe	Severe	Quaking aspen-------	45	32	---
						Black spruce--------	---	---	
						Tamarack------------	---	---	
						Northern whitecedar-	---	---	
						Balsam fir----------	---	---	
						Red maple-----------	---	---	
						Jack pine-----------	---	---	
						Eastern white pine--	---	---	
						Paper birch---------	---	---	
LaC:									
Laona----------	3L	Slight	Slight	Moderate	Moderate	Sugar maple---------	65	40	Red pine, white spruce, eastern white pine.
						American basswood---	---	---	
						White ash-----------	---	---	
						Quaking aspen-------	---	---	
						Northern red oak----	---	---	
Sarona---------	3L	Slight	Slight	Slight	Moderate	Sugar maple---------	64	40	Red pine, white spruce, eastern white pine.
						Northern red oak----	72	69	
						American basswood---	70	66	
						Quaking aspen-------	---	---	
						White ash-----------	75	73	
						Eastern hemlock-----	---	---	

See footnote at end of table.

Table 5.--Woodland Management and Productivity--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Seedling mortality	Windthrow hazard	Plant competition	Common trees	Site index	Volume*	
LaD:									
Laona	3R	Moderate	Slight	Moderate	Moderate	Sugar maple	65	40	Red pine, white spruce, eastern white pine.
						American basswood	---	---	
						White ash	---	---	
						Quaking aspen	---	---	
						Northern red oak	---	---	
Sarona	3R	Moderate	Slight	Slight	Moderate	Sugar maple	64	40	Red pine, white spruce, eastern white pine.
						Northern red oak	72	69	
						American basswood	70	66	
						Quaking aspen	---	---	
						White ash	75	73	
						Eastern hemlock	---	---	
Lu:									
Lupton	6W	Slight	Severe	Severe	Severe	Balsam fir	46	86	---
						Black spruce	20	29	
						Black ash	---	---	
						Northern whitecedar	---	---	
						Paper birch	---	---	
						Tamarack	---	---	
						Red maple	---	---	
						Quaking aspen	---	---	
						White spruce	---	---	
Cathro	5W	Slight	Severe	Severe	Severe	Balsam fir	40	71	White spruce.
						Northern whitecedar	---	---	
						Tamarack	---	---	
						Paper birch	---	---	
						Red maple	---	---	
						Black spruce	---	---	
						White spruce	---	---	
Markey	7W	Slight	Severe	Severe	Severe	Balsam fir	52	100	---
						Quaking aspen	---	---	
						Black spruce	---	---	
						Tamarack	---	---	
						Black ash	---	---	
						Northern whitecedar	---	---	
						Paper birch	---	---	
						Red maple	---	---	
						White spruce	---	---	
MaA	3A	Slight	Slight	Slight	Moderate	Sugar maple	60	38	Red pine, eastern white pine, jack pine.
Manitowish						Red pine	59	99	
						Quaking aspen	---	---	
						Eastern white pine	---	---	
						Paper birch	---	---	
						Red maple	---	---	

See footnote at end of table.

Table 5.--Woodland Management and Productivity--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Seedling mortality	Windthrow hazard	Plant competition	Common trees	Site index	Volume*	
MeD:									
Metonga	3R	Moderate	Slight	Moderate	Moderate	Sugar maple	60	38	White spruce, eastern white pine.
						Red maple	---	---	
						Paper birch	---	---	
						Yellow birch	60	38	
						Balsam fir	---	---	
						Bigtooth aspen	---	---	
						Eastern hemlock	---	---	
						White spruce	---	---	
						Black cherry	---	---	
						Northern red oak	---	---	
						American basswood	---	---	
						Quaking aspen	---	---	
Rock outcrop.									
Mn	7W	Slight	Severe	Severe	Severe	Balsam fir	54	105	Red maple, white ash, white spruce, black spruce.
Minocqua						Red maple	55	35	
						White ash	---	---	
						Black ash	---	---	
						Tamarack	55	50	
						Northern whitecedar	---	---	
						Quaking aspen	---	---	
MuB	3W	Slight	Moderate	Severe	Severe	Red maple	63	39	Red maple, white ash, white spruce, eastern white pine, red pine.
Mudlake						Yellow birch	---	---	
						Sugar maple	---	---	
						White ash	---	---	
						Balsam fir	---	---	
						Quaking aspen	---	---	
						Eastern hemlock	---	---	
						Paper birch	---	---	
PaB, PaC	3L	Slight	Slight	Slight	Moderate	Sugar maple	67	41	Red pine, eastern white pine, white spruce.
Padus						Northern red oak	70	66	
						Bigtooth aspen	78	91	
						White ash	---	---	
						American basswood	---	---	
						Red pine	---	---	
						Red maple	---	---	
						Eastern hemlock	---	---	
PaD	3R	Moderate	Slight	Slight	Moderate	Sugar maple	67	41	Red pine, eastern white pine, white spruce.
Padus						Northern red oak	70	66	
						Bigtooth aspen	78	91	
						White ash	---	---	
						American basswood	---	---	
						Red pine	---	---	
						Red maple	---	---	
						Eastern hemlock	---	---	
PeB, PeC:									
Padus	3L	Slight	Slight	Slight	Moderate	Sugar maple	67	41	Red pine, eastern white pine, white spruce.
						Northern red oak	70	66	
						Bigtooth aspen	78	91	
						White ash	---	---	
						American basswood	---	---	
						Red pine	---	---	
						Red maple	---	---	
						Eastern hemlock	---	---	

See footnote at end of table.

Table 5.--Woodland Management and Productivity--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Seedling mortality	Wind-throw hazard	Plant competition	Common trees	Site index	Volume*	
PeB, PeC:									
Pence	3A	Slight	Slight	Slight	Slight	Sugar maple	59	37	Red pine, eastern white pine, jack pine.
						Red pine	59	99	
						Eastern white pine	57	112	
						American basswood	---	---	
						Balsam fir	---	---	
						Quaking aspen	---	---	
						Paper birch	---	---	
						Yellow birch	---	---	
						Red maple	---	---	
						Northern red oak	---	---	
						White ash	---	---	
						Eastern hemlock	---	---	
PeD:									
Padus	3R	Moderate	Slight	Slight	Moderate	Sugar maple	67	41	Red pine, eastern white pine, white spruce.
						Northern red oak	70	66	
						Bigtooth aspen	78	91	
						White ash	---	---	
						American basswood	---	---	
						Red pine	---	---	
						Red maple	---	---	
						Eastern hemlock	---	---	
Pence	3R	Moderate	Slight	Slight	Slight	Sugar maple	59	37	Red pine, eastern white pine, jack pine.
						Red pine	59	99	
						Eastern white pine	57	112	
						American basswood	---	---	
						Balsam fir	---	---	
						Quaking aspen	---	---	
						Paper birch	---	---	
						Yellow birch	---	---	
						Red maple	---	---	
						Northern red oak	---	---	
						White ash	---	---	
						Eastern hemlock	---	---	
PfD:									
Padus	3R	Moderate	Slight	Slight	Moderate	Sugar maple	67	41	Red pine, eastern white pine, white spruce.
						Northern red oak	70	66	
						Bigtooth aspen	78	91	
						White ash	---	---	
						American basswood	---	---	
						Red pine	---	---	
						Red maple	---	---	
						Eastern hemlock	---	---	
Soperton	3R	Moderate	Slight	Moderate	Moderate	Sugar maple	67	41	White spruce, red pine.
						American basswood	74	72	
						Yellow birch	72	44	
						White ash	78	78	
						Eastern hemlock	---	---	

See footnote at end of table.

Table 5.--Woodland Management and Productivity--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Seedling mortality	Windthrow hazard	Plant competition	Common trees	Site index	Volume*	
PgB, PgC:									
Padus	3L	Slight	Slight	Slight	Moderate	Sugar maple	67	41	Red pine, eastern white pine, white spruce.
						Northern red oak	70	66	
						Bigtooth aspen	78	91	
						White ash	---	---	
						American basswood	---	---	
						Red pine	---	---	
						Red maple	---	---	
						Eastern hemlock	---	---	
Wabeno	3L	Slight	Slight	Moderate	Moderate	Sugar maple	67	41	White spruce, red pine.
						American basswood	74	72	
						Yellow birch	72	44	
						White ash	78	78	
PhB	3L	Slight	Slight	Slight	Moderate	Sugar maple	67	41	White spruce, eastern white pine, red pine.
Padwood						American basswood	---	---	
						Northern red oak	---	---	
						Yellow birch	---	---	
						Red maple	---	---	
						White ash	---	---	
						Paper birch	---	---	
						Eastern hophornbeam	---	---	
						Bigtooth aspen	---	---	
						Eastern hemlock	---	---	
PkE	8R	Moderate	Moderate	Slight	Slight	Red pine	66	117	Red pine, eastern white pine, jack pine.
Pelissier						Quaking aspen	---	---	
						Paper birch	---	---	
						Northern pin oak	---	---	
						Red maple	---	---	
						Eastern white pine	---	---	
						White spruce	---	---	
						Balsam fir	---	---	
PnB, PnC	3A	Slight	Slight	Slight	Slight	Sugar maple	59	37	Red pine, eastern white pine, jack pine.
Pence						Red pine	59	99	
						Eastern white pine	57	112	
						American basswood	---	---	
						Balsam fir	---	---	
						Quaking aspen	---	---	
						Paper birch	---	---	
						Yellow birch	---	---	
						Red maple	---	---	
						Northern red oak	---	---	
						White ash	---	---	
						Eastern hemlock	---	---	
PnD	3R	Moderate	Slight	Slight	Slight	Sugar maple	59	37	Red pine, eastern white pine, jack pine.
Pence						Red pine	59	99	
						Eastern white pine	57	112	
						American basswood	---	---	
						Balsam fir	---	---	
						Quaking aspen	---	---	
						Paper birch	---	---	
						Yellow birch	---	---	
						Red maple	---	---	
						Northern red oak	---	---	
						White ash	---	---	
						Eastern hemlock	---	---	

See footnote at end of table.

Table 5.--Woodland Management and Productivity--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Seedling mortality	Wind-throw hazard	Plant competition	Common trees	Site index	Volume*	
PsB, PsC:									
Pence	3A	Slight	Slight	Slight	Slight	Sugar maple	59	37	Red pine, eastern white pine, jack pine.
						Red pine	59	99	
						Eastern white pine	57	112	
						American basswood	---	---	
						Balsam fir	---	---	
						Quaking aspen	---	---	
						Paper birch	---	---	
						Yellow birch	---	---	
						Red maple	---	---	
						Northern red oak	---	---	
						White ash	---	---	
						Eastern hemlock	---	---	
Vilas	6A	Slight	Slight	Slight	Slight	Red pine	57	93	Red pine, jack pine, eastern white pine.
						Jack pine	65	94	
						Eastern white pine	56	109	
						Northern pin oak	---	---	
						Balsam fir	---	---	
						Quaking aspen	---	---	
						Northern red oak	---	---	
						Red maple	---	---	
						Paper birch	---	---	
PsD:									
Pence	3R	Moderate	Slight	Slight	Slight	Sugar maple	59	37	Red pine, eastern white pine, jack pine.
						Red pine	59	99	
						Eastern white pine	57	112	
						American basswood	---	---	
						Balsam fir	---	---	
						Quaking aspen	---	---	
						Paper birch	---	---	
						Yellow birch	---	---	
						Red maple	---	---	
						Northern red oak	---	---	
						White ash	---	---	
						Eastern hemlock	---	---	
Vilas	6R	Moderate	Slight	Slight	Slight	Red pine	57	93	Red pine, jack pine, eastern white pine.
						Jack pine	65	94	
						Eastern white pine	56	109	
						Northern pin oak	---	---	
						Balsam fir	---	---	
						Quaking aspen	---	---	
						Northern red oak	---	---	
						Red maple	---	---	
						Paper birch	---	---	
RuD	4R	Moderate	Moderate	Slight	Slight	Quaking aspen	60	64	Red pine, jack pine, eastern white pine.
Rubicon						Jack pine	53	73	
						Red pine	53	82	
						Bigtooth aspen	66	75	
						Northern red oak	---	---	
						Red maple	57	36	
						Paper birch	---	---	
						Eastern white pine	45	75	
						White oak	---	---	

See footnote at end of table.

Table 5.--Woodland Management and Productivity--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Seedling mortality	Windthrow hazard	Plant competition	Common trees	Site index	Volume*	
SoD:									
Soperton	3R	Moderate	Slight	Moderate	Moderate	Sugar maple	67	41	White spruce, red pine.
						American basswood	74	72	
						Yellow birch	72	44	
						White ash	78	78	
						Eastern hemlock	56	---	
Goodman	3R	Moderate	Slight	Slight	Severe	Sugar maple	69	42	Eastern white pine, red pine, white spruce.
						Yellow birch	---	---	
						American basswood	68	63	
						Bigtooth aspen	---	---	
						Quaking aspen	---	---	
						Paper birch	---	---	
SpD:									
Soperton	3R	Moderate	Slight	Moderate	Moderate	Sugar maple	67	41	White spruce, red pine.
						American basswood	74	72	
						Yellow birch	72	44	
						White ash	78	78	
						Eastern hemlock	56	---	
Mudlake	3W	Slight	Moderate	Severe	Severe	Red maple	63	39	Red maple, white ash, white spruce, eastern white pine, red pine.
						Yellow birch	---	---	
						Sugar maple	---	---	
						White ash	---	---	
						Balsam fir	---	---	
						Quaking aspen	---	---	
						Eastern hemlock	---	---	
						Paper birch	---	---	
StB, StC Stambaugh	3L	Slight	Slight	Slight	Severe	Sugar maple	61	38	Eastern white pine, white spruce, red pine.
						Yellow birch	---	---	
						American basswood	---	---	
						Eastern hemlock	---	---	
						Eastern white pine	---	---	
						Red maple	---	---	
						Balsam fir	---	---	
StD Stambaugh	3R	Moderate	Slight	Slight	Severe	Sugar maple	61	38	Eastern white pine, white spruce, red pine.
						Yellow birch	---	---	
						American basswood	---	---	
						Eastern hemlock	---	---	
						Eastern white pine	---	---	
						Red maple	---	---	
						Balsam fir	---	---	
TpA Tipler	3L	Slight	Slight	Slight	Moderate	Sugar maple	67	41	Red pine, eastern white pine, white spruce.
						Northern red oak	70	66	
						American basswood	---	---	
						White ash	---	---	
						Eastern hemlock	---	---	
						Red maple	---	---	
VaB Vanzile	3L	Slight	Slight	Slight	Severe	Sugar maple	61	38	Eastern white pine, red pine, white spruce.
						Yellow birch	---	---	
						American basswood	---	---	
						Eastern hemlock	---	---	
						Eastern white pine	---	---	

See footnote at end of table.

Table 5.--Woodland Management and Productivity--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Seedling mortality	Windthrow hazard	Plant competition	Common trees	Site index	Volume*	
VsB, VsC-------- Vilas	6A	Slight	Slight	Slight	Slight	Red pine---------- Jack pine---------- Eastern white pine-- Northern pin oak---- Balsam fir---------- Quaking aspen------- Northern red oak---- Red maple---------- Paper birch---------	57 65 56 --- --- --- --- --- ---	93 94 109 --- --- --- --- --- ---	Red pine, jack pine, eastern white pine.
WaC: Wabeno---------	3L	Slight	Slight	Moderate	Moderate	Sugar maple--------- American basswood--- Yellow birch-------- White ash----------	67 74 72 78	41 72 44 78	White spruce, red pine.
Goodman-------- Yellow birch-------- American basswood--- Bigtooth aspen------ Quaking aspen------- Paper birch---------	3L	Slight	Slight	Slight	Severe	Sugar maple--------- Yellow birch-------- American basswood--- Bigtooth aspen------ Quaking aspen------- Paper birch---------	69 --- 68 --- --- ---	42 --- 63 --- --- ---	Eastern white pine, red pine, white spruce.
WbB: Wabeno---------	3L	Slight	Slight	Moderate	Moderate	Sugar maple--------- American basswood--- Yellow birch-------- White ash----------	67 74 72 78	41 72 44 78	White spruce, red pine.
Goodwit-------- Yellow birch-------- American basswood--- Bigtooth aspen------ Quaking aspen------- Paper birch--------- White ash---------- Black cherry-------- Eastern hophornbeam-	3L	Slight	Slight	Slight	Severe	Sugar maple--------- Yellow birch-------- American basswood--- Bigtooth aspen------ Quaking aspen------- Paper birch--------- White ash---------- Black cherry-------- Eastern hophornbeam-	69 --- 68 --- --- --- --- --- ---	42 --- 63 --- --- --- --- --- ---	Eastern white pine, red pine, white spruce.
WdB: Wabeno---------	3L	Slight	Slight	Moderate	Moderate	Sugar maple--------- American basswood--- Yellow birch-------- White ash----------	67 74 72 78	41 72 44 78	White spruce, red pine.
Mudlake-------- Yellow birch-------- Sugar maple--------- White ash---------- Balsam fir---------- Quaking aspen------- Eastern hemlock----- Paper birch---------	3W	Slight	Moderate	Severe	Severe	Red maple---------- Yellow birch-------- Sugar maple--------- White ash---------- Balsam fir---------- Quaking aspen------- Eastern hemlock----- Paper birch---------	63 --- --- --- --- --- --- ---	39 --- --- --- --- --- --- ---	Red maple, white ash, white spruce, eastern white pine, red pine.
WhA------------- Whisklake Yellow birch-------- Sugar maple--------- Balsam fir---------- White spruce-------- Eastern hemlock-----	2W	Slight	Moderate	Severe	Severe	Red maple---------- Sugar maple--------- Yellow birch-------- Balsam fir---------- White spruce-------- Eastern hemlock-----	55 --- --- --- --- ---	35 --- --- --- --- ---	Red maple, white spruce, eastern white pine.

See footnote at end of table.

Table 5.--Woodland Management and Productivity--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Seedling mortality	Windthrow hazard	Plant competition	Common trees	Site index	Volume*	
WrA--Worcester	2W	Slight	Moderate	Severe	Severe	Red maple	55	35	Red maple, white spruce, eastern white pine.
						Sugar maple	---	---	
						Yellow birch	---	---	
						Balsam fir	---	---	
						White spruce	---	---	
						Paper birch	---	---	
						Quaking aspen	---	---	
						Eastern hemlock	---	---	
WtA--Wormet	2W	Slight	Moderate	Severe	Severe	Red maple	55	35	Eastern white pine, red maple, white spruce.
						Sugar maple	---	---	
						Yellow birch	---	---	
						Balsam fir	---	---	
						White spruce	---	---	
						Red pine	---	---	
						Eastern white pine	---	---	
						Paper birch	---	---	
						Quaking aspen	---	---	

* Volume is the yield in cubic feet per acre per year calculated at the age of culmination of the mean annual increment for fully stocked natural stands.

Table 6.--Woodland Equipment Use

(Only the soils suitable for the production of commercial trees are listed. Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated)

Soil name and map symbol	Ratings for the most limiting season				Preferred operating season(s)
	Logging areas and skid trails	Log landings	Haul roads	Site preparation and planting	
ArB:					
Argonne	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Summer, fall, winter.
Sarwet	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Summer, fall, winter.
Au	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Summer, winter.
Au Gres					
Ca	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Winter.
Capitola					
CrA	Slight	Slight	Slight	Slight	Year round.
Croswell					
CuA	Slight	Slight	Slight	Slight	Year round.
Cublake					
FeB	Severe: low strength.	Severe: low strength.	Severe: low strength.	Severe: low strength.	Summer, fall, winter.*
Fence					
FlA	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Summer, winter.
Flink					
Fm	Severe: wetness, low strength.	Severe: wetness, flooding, low strength.	Severe: wetness, flooding, low strength.	Severe: wetness, low strength.	Winter.
Fordum					
GaA	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Summer, winter.*
Gastrow					
Kr	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Winter.
Kinross					
LaC:					
Laona	Moderate: low strength.	Moderate: slope, low strength.	Moderate: low strength.	Moderate: low strength.	Summer, fall, winter.
Sarona	Moderate: low strength.	Moderate: slope, low strength.	Moderate: low strength.	Moderate: low strength.	Summer, fall, winter.
LaD:					
Laona	Moderate: slope, low strength.	Severe: slope.	Moderate: slope, low strength.	Moderate: slope, low strength.	Summer, fall, winter.
Sarona	Moderate: slope, low strength.	Severe: slope.	Moderate: slope, low strength.	Moderate: slope, low strength.	Summer, fall, winter.

See footnote at end of table.

Table 6.--Woodland Equipment Use--Continued

Soil name and map symbol	Ratings for the most limiting season				Preferred operating season(s)
	Logging areas and skid trails	Log landings	Haul roads	Site preparation and planting	
Lu:					
Lupton	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Winter.
Cathro	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness. low strength.	Severe: wetness, low strength.	Winter.
Markey	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Winter.
MaA---- Manitowish	Slight---	Slight---	Slight---	Slight---	Year round.
MeD:					
Metonga	Moderate: rock outcrop, slope, low strength.	Severe: slope.	Moderate: rock outcrop, slope, low strength.	Moderate: rock outcrop, slope, low strength.	Summer, fall, winter.
Rock outcrop.					
Mn---- Minocqua	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Winter.
MuB---- Mudlake	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Summer, winter.*
PaB---- Padus	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Summer, fall, winter.
PaC---- Padus	Moderate: low strength.	Moderate: slope, low strength.	Moderate: low strength.	Moderate: low strength.	Summer, fall, winter.
PaD---- Padus	Moderate: slope, low strength.	Severe: slope.	Moderate: slope, low strength.	Moderate: slope, low strength.	Summer, fall, winter.
PeB:					
Padus	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Summer, fall, winter.
Pence	Slight---	Slight---	Slight---	Slight---	Year round.
PeC:					
Padus	Moderate: low strength.	Moderate: slope, low strength.	Moderate: low strength.	Moderate: low strength.	Summer, fall, winter.
Pence	Slight---	Moderate: slope.	Slight---	Slight---	Year round.
PeD:					
Padus	Moderate: slope, low strength.	Severe: slope.	Moderate: slope, low strength.	Moderate: slope, low strength.	Summer, fall, winter.

See footnote at end of table.

Table 6.--Woodland Equipment Use--Continued

Soil name and map symbol	Ratings for the most limiting season				Preferred operating season(s)
	Logging areas and skid trails	Log landings	Haul roads	Site preparation and planting	
PeD:					
Pence	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Year round.
PfD:					
Padus	Moderate: slope, low strength.	Severe: slope.	Moderate: slope, low strength.	Moderate: slope, low strength.	Summer, fall, winter.*
Soperton	Moderate: slope, low strength.	Severe: slope.	Moderate: slope, low strength.	Moderate: slope, low strength.	Summer, fall, winter.*
PgB:					
Padus	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Summer, fall, winter.*
Wabeno	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Summer, fall, winter.*
PgC:					
Padus	Moderate: low strength.	Moderate: slope, low strength.	Moderate: low strength.	Moderate: low strength.	Summer, fall, winter.*
Wabeno	Moderate: low strength.	Moderate: slope, low strength.	Moderate: low strength.	Moderate: low strength.	Summer, fall, winter.*
PhB	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Summer, fall, winter.
Padwood					
PkE	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Year round.
Pelissier					
PnB	Slight	Slight	Slight	Slight	Year round.
Pence					
PnC	Slight	Moderate: slope.	Slight	Slight	Year round.
Pence					
PnD	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Year round.
Pence					
PsB:					
Pence	Slight	Slight	Slight	Slight	Year round.
Vilas	Slight	Slight	Slight	Slight	Year round.
PsC:					
Pence	Slight	Moderate: slope.	Slight	Slight	Year round.
Vilas	Slight	Moderate: slope.	Slight	Slight	Year round.

See footnote at end of table.

Table 6.--Woodland Equipment Use--Continued

Soil name and map symbol	Ratings for the most limiting season				Preferred operating season(s)
	Logging areas and skid trails	Log landings	Haul roads	Site preparation and planting	
PsD:					
Pence	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Year round.
Vilas	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Year round.
RuD:					
Rubicon	Moderate: too sandy, slope.	Severe: slope.	Moderate: slope, too sandy.	Moderate: too sandy, slope.	Year round.
SoD:					
Soperton	Moderate: slope, low strength.	Severe: slope.	Moderate: slope, low strength.	Moderate: slope, low strength.	Summer, fall, winter.*
Goodman	Moderate: slope, low strength.	Severe: slope.	Moderate: slope, low strength.	Moderate: slope, low strength.	Summer, fall, winter.*
SpD:					
Soperton	Moderate: slope, low strength.	Severe: slope.	Moderate: slope, low strength.	Moderate: slope, low strength.	Summer, fall, winter.*
Mudlake	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Summer, winter.*
StB:					
Stambaugh	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Summer, fall, winter.*
StC:					
Stambaugh	Moderate: low strength.	Moderate: slope, low strength.	Moderate: low strength.	Moderate: low strength.	Summer, fall, winter.*
StD:					
Stambaugh	Moderate: slope, low strength.	Severe: slope.	Moderate: slope, low strength.	Moderate: slope, low strength.	Summer, fall, winter.*
TpA:					
Tipler	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Summer, fall, winter.
VaB:					
Vanzile	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Summer, fall, winter.*
VsB:					
Vilas	Slight	Slight	Slight	Slight	Year round.
VsC:					
Vilas	Slight	Moderate: slope.	Slight	Slight	Year round.
WaC:					
Wabeno	Moderate: low strength.	Moderate: slope, low strength.	Moderate: low strength.	Moderate: low strength.	Summer, fall, winter.*
Goodman	Moderate: low strength.	Moderate: slope, low strength.	Moderate: low strength.	Moderate: low strength.	Summer, fall, winter.*

See footnote at end of table.

Table 6.--Woodland Equipment Use--Continued

Soil name and map symbol	Ratings for the most limiting season				Preferred operating season(s)
	Logging areas and skid trails	Log landings	Haul roads	Site preparation and planting	
WbB:					
Wabeno	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Summer, fall, winter.*
Goodwit	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Summer, fall, winter.*
WdB:					
Wabeno	Moderate: low strength.	Moderate: slope, low strength.	Moderate: low strength.	Moderate: low strength.	Summer, fall, winter.*
Mudlake	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Summer, winter.*
WhA	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Summer, winter.*
Whisklake					
WrA	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Summer, winter.
Worcester					
WtA	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Summer, winter.
Wormet					

* Equipment operations may be severely restricted after a heavy rainfall because the soil has a high content of silt. The soil is slippery when wet and can easily become rutted.

Table 7.--Land Capability and Yields per Acre of Crops and Pasture

(Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil)

Soil name and map symbol	Land capability	Corn	Corn silage	Oats	Bromegrass-alfalfa hay	Timothy-red clover hay	Kentucky bluegrass
		Bu	Tons	Bu	Tons	Tons	AUM*
ArB---- Argonne-Sarwet	IIe**	70	11	70	3.5	2.7	2.5
Au---- Au Gres	IVw	50	8	45	2.5	2.5	2.2
Ca---- Capitola	VIIw	---	---	---	---	---	---
CrA---- Croswell	IVs	50	8	45	2.5	2.0	2.0
CuA---- Cublake	IVs	55	9	55	2.8	2.5	2.1
FeB---- Fence	IIe	75	12	70	4.0	3.5	3.6
FlA---- Flink	IVw	55	9	50	2.7	2.7	2.3
Fm---- Fordum	VIw	---	---	---	---	---	---
GaA---- Gastrow	IIw	75	12	70	3.5	3.0	3.2
Kr---- Kinross	VIw	---	---	---	---	---	---
LaC---- Laona-Sarona	IIIe**	65	10	65	3.3	2.5	2.3
LaD---- Laona-Sarona	VIIe	---	---	---	---	---	1.8
Lo---- Loxley, Beseman, and Dawson	VIIw	---	---	---	---	---	---
Lu---- Lupton, Cathro, and Markey	VIw	---	---	---	---	---	---
MaA---- Manitowish	IIIs	65	10	60	3.5	3.0	2.6
MeD---- Metonga-Rock outcrop	VIIIs	---	---	---	---	---	---
Mn---- Minocqua	VIw	---	---	---	---	---	---

See footnotes at end of table.

Table 7.--Land Capability and Yields per Acre of Crops and Pasture--Continued

Soil name and map symbol	Land capability	Corn	Corn silage	Oats	Bromegrass-alfalfa hay	Timothy-red clover hay	Kentucky bluegrass
		Bu	Tons	Bu	Tons	Tons	AUM*
MuB--Mudlake	IIe**	75	12	70	3.5	3.0	3.2
PaB--Padus	IIe	70	11	70	4.0	3.0	3.2
PaC--Padus	IIIe	65	10	65	3.8	2.8	3.0
PaD--Padus	VIe	---	---	---	---	---	2.1
PeB--Padus-Pence	IIIe	65	10	65	3.7	2.8	2.8
PeC--Padus-Pence	IVe	60	10	60	3.5	2.5	2.6
PeD--Padus-Pence	VIIe	---	---	---	---	---	2.0
PfD--Padus-Soperton	VIIe	---	---	---	---	---	2.6
PgB--Padus-Wabeno	IIe**	75	12	75	3.5	3.0	3.4
PgC--Padus-Wabeno	IIIe**	70	11	70	3.3	2.8	3.2
PhB--Padwood	IIe	75	12	75	4.1	3.1	3.3
PkE--Pelissier	VIIs	---	---	---	---	---	---
PnB--Pence	IIIe	60	10	55	3.5	2.5	2.5
PnC--Pence	IVe	55	9	50	3.3	2.3	2.3
PnD--Pence	VIIe	---	---	---	---	---	1.7
PsB--Pence-Vilas	IVs	55	9	50	2.9	2.1	2.2
PsC--Pence-Vilas	VIs	50	8	45	2.7	1.9	1.8
PsD--Pence-Vilas	VIIe	---	---	---	---	---	1.3
Pt--Pits, gravel	VIIIs	---	---	---	---	---	---
RuD--Rubicon	VIIs	---	---	---	---	---	1.0

See footnotes at end of table.

Table 7.--Land Capability and Yields per Acre of Crops and Pasture--Continued

Soil name and map symbol	Land capability	Corn	Corn silage	Oats	Bromegrass-alfalfa hay	Timothy-red clover hay	Kentucky bluegrass
		Bu	Tons	Bu	Tons	Tons	AUM*
SoD--Soperton-Goodman	VIIe	---	---	---	---	---	2.6
SpD--Soperton-Mudlake	VIIe	---	---	---	---	---	2.8
StB--Stambaugh	IIe	75	12	75	4.2	3.5	3.6
StC--Stambaugh	IIIe	70	11	70	4.0	3.5	3.4
StD--Stambaugh	VIe	---	---	---	---	---	3.0
TpA--Tipler	IIs	75	12	70	4.0	3.0	3.2
VaB--Vanzile	IIe	75	12	75	4.2	3.5	3.6
VsB--Vilas	IVs	50	8	45	2.5	1.9	1.8
VsC--Vilas	VIs	45	7	40	2.3	1.7	1.5
WaC--Wabeno-Goodman	IIIe**	75	12	70	3.3	2.8	3.2
WbB--Wabeno-Goodwit	IIe**	80	13	75	3.5	3.0	3.4
WdB--Wabeno-Mudlake	IIIe**	75	12	70	3.3	2.9	3.3
WhA--Whisklake	IIw	70	11	75	4.0	3.0	3.6
WrA--Worcester	IIw	70	11	70	3.8	3.0	3.4
WtA--Wormet	IIw	65	10	60	3.5	3.0	2.6

* Animal unit month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

** In areas where stones have been removed.

Table 8.--Prime Farmland

(Only the soils considered prime farmland are listed. Urban or built-up areas of the soils listed are not considered prime farmland. If a soil is prime farmland only under certain conditions, the conditions are specified in parentheses after the soil name)

Map symbol	Soil name
ArB	Argonne-Sarwet sandy loams, 1 to 6 percent slopes, very stony
Ca	Capitola muck, 0 to 2 percent slopes, very stony (where drained)
FeB	Fence silt loam, 0 to 6 percent slopes
GaA	Gastrow silt loam, 0 to 3 percent slopes (where drained)
Mn	Minocqua muck, 0 to 2 percent slopes (where drained)
MuB	Mudlake silt loam, 1 to 6 percent slopes, very stony (where drained)
PaB	Padus sandy loam, 0 to 6 percent slopes
PgB	Padus-Wabeno silt loams, 1 to 6 percent slopes, very stony
PhB	Padwood sandy loam, 0 to 6 percent slopes
StB	Stambaugh silt loam, 0 to 6 percent slopes
TpA	Tipler sandy loam, 0 to 3 percent slopes
VaB	Vanzile silt loam, 0 to 6 percent slopes
WbB	Wabeno-Goodwit silt loams, 1 to 6 percent slopes, very stony
WhA	Whisklake silt loam, 0 to 3 percent slopes (where drained)
WrA	Worcester sandy loam, 0 to 3 percent slopes (where drained)

Table 9.--Windbreaks and Environmental Plantings

(Only the soils suitable for windbreaks and environmental plantings are listed. Absence of an entry indicates that trees generally do not grow to the given height on that soil)

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
ArB:					
Argonne	Manyflower cotoneaster.	Siberian peashrub, lilac, common ninebark, northern whitecedar, Amur maple.	Norway spruce	Eastern white pine, red pine, jack pine.	---
Sarwet	Manyflower cotoneaster.	Siberian peashrub, lilac, American cranberrybush, Amur maple, silky dogwood, gray dogwood, northern whitecedar.	Norway spruce	Eastern white pine, red pine, jack pine.	---
Au Au Gres	---	American cranberrybush, Amur maple, common ninebark, nannyberry viburnum, northern whitecedar.	White spruce, Manchurian crabapple, Norway spruce.	Jack pine, green ash, eastern white pine.	Imperial Carolina poplar.
CrA Croswell	Manyflower cotoneaster.	Amur maple, lilac, Siberian peashrub, northern whitecedar.	Norway spruce	Eastern white pine, red pine, jack pine.	---
CuA Cublake	Manyflower cotoneaster.	Siberian peashrub, lilac, smooth sumac, staghorn sumac, northern whitecedar.	Manchurian crabapple, Austrian pine.	Eastern white pine, red pine, jack pine.	---
FeB Fence	---	Northern whitecedar, lilac, American cranberrybush, Amur maple, silky dogwood, gray dogwood.	White spruce, Norway spruce.	Eastern white pine, red pine, white ash, red maple.	---
FlA Flink	---	American cranberrybush, silky dogwood, nannyberry viburnum, northern whitecedar, sargent crabapple, lilac.	Manchurian crabapple, white spruce, Norway spruce.	Eastern white pine, green ash, red pine.	---

Table 9.--Windbreaks and Environmental Plantings--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
GaA---------- Gastrow	---	Common ninebark, nannyberry viburnum, northern whitecedar, Amur maple, lilac, silky dogwood, American cranberrybush.	White spruce------	Red pine, eastern white pine, white ash, red maple, silver maple.	Imperial Carolina poplar.
LaC, LaD:					
Laona----------	---	Northern whitecedar, Siberian peashrub, lilac, common ninebark, Amur maple.	Norway spruce-----	Eastern white pine, red pine, jack pine.	---
Sarona----------	Manyflower cotoneaster.	Northern whitecedar, Siberian peashrub, lilac, American cranberrybush, Amur maple, silky dogwood, gray dogwood.	Norway spruce-----	Eastern white pine, red pine, jack pine.	---
MaA---------- Manitowish	Manyflower cotoneaster.	Northern whitecedar, Amur maple, lilac, American cranberrybush, Siberian peashrub, silky dogwood, gray dogwood.	Norway spruce-----	Eastern white pine, red pine, jack pine.	---
MeD:					
Metonga----------	Manyflower cotoneaster.	Lilac, Amur maple, American cranberrybush, Siberian peashrub, silky dogwood, gray dogwood.	Norway spruce-----	Eastern white pine, red pine, jack pine.	---
Rock outcrop.					
MuB---------- Mudlake	---	Silky dogwood, northern whitecedar, nannyberry viburnum, redosier dogwood, lilac, American cranberrybush.	White spruce------	Red maple, eastern white pine, white ash, silver maple.	---

Table 9.--Windbreaks and Environmental Plantings--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
PaB, PaC, PaD----- Padus	Manyflower cotoneaster.	Gray dogwood, silky dogwood, Siberian peashrub, American cranberrybush, Amur maple, lilac, northern whitecedar.	Norway spruce-----	Jack pine, red pine, eastern white pine.	---
PeB, PeC, PeD:					
Padus----------	Manyflower cotoneaster.	Gray dogwood, silky dogwood, Siberian peashrub, American cranberrybush, Amur maple, lilac, northern whitecedar.	Norway spruce-----	Jack pine, red pine, eastern white pine.	---
Pence----------	Manyflower cotoneaster.	Northern whitecedar, Amur maple, lilac, American cranberrybush, Siberian peashrub, silky dogwood, gray dogwood.	Norway spruce-----	Eastern white pine, red pine, jack pine.	---
PfD:					
Padus----------	Manyflower cotoneaster.	Gray dogwood, silky dogwood, Siberian peashrub, American cranberrybush, Amur maple, lilac, northern whitecedar.	Norway spruce-----	Jack pine, red pine, eastern white pine.	---
Soperton---------	---	Amur maple, Siberian peashrub, lilac, gray dogwood, northern whitecedar.	White spruce, Norway spruce, Black Hills spruce.	Eastern white pine, red pine, white ash.	---
PgB, PgC:					
Padus----------	Manyflower cotoneaster.	Gray dogwood, silky dogwood, Siberian peashrub, American cranberrybush, Amur maple, lilac, northern whitecedar.	Norway spruce-----	Jack pine, red pine, eastern white pine.	---

Table 9.--Windbreaks and Environmental Plantings--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
PgB, PgC:					
Wabeno	---	Siberian peashrub, Amur maple, lilac, northern whitecedar.	White spruce, Norway spruce, Black Hills spruce.	Eastern white pine, red pine, white ash.	---
PhB	Manyflower cotoneaster.	Lilac, Amur maple, American cranberrybush, Siberian peashrub, silky dogwood, gray dogwood, northern whitecedar.	Norway spruce-----	Eastern white pine, red pine, jack pine.	---
Padwood					
PnB, PnC, PnD	Manyflower cotoneaster.	Northern whitecedar, Amur maple, lilac, American cranberrybush, Siberian peashrub, silky dogwood, gray dogwood.	Norway spruce-----	Eastern white pine, red pine, jack pine.	---
Pence					
PsB, PsC, PsD:					
Pence	Manyflower cotoneaster.	Northern whitecedar, Amur maple, lilac, American cranberrybush, Siberian peashrub, silky dogwood, gray dogwood.	Norway spruce-----	Eastern white pine, red pine, jack pine.	---
Vilas	Manyflower cotoneaster.	Northern whitecedar, Amur maple, lilac, American cranberrybush, Siberian peashrub, silky dogwood, gray dogwood.	Norway spruce-----	Eastern white pine, red pine, jack pine.	---
RuD	Manyflower cotoneaster.	Northern whitecedar, smooth sumac, lilac, Siberian peashrub, staghorn sumac.	Norway spruce-----	Eastern white pine, red pine, jack pine.	---
Rubicon					

Table 9.--Windbreaks and Environmental Plantings--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
SoD:					
Soperton	---	Amur maple, Siberian peashrub, lilac, gray dogwood, northern whitecedar.	White spruce, Norway spruce, Black Hills spruce.	Eastern white pine, red pine, white ash.	---
Goodman	---	Amur maple, northern whitecedar, gray dogwood, lilac, American cranberrybush.	White spruce, Norway spruce, Black Hills spruce.	Eastern white pine, red pine, white ash, red maple.	---
SpD:					
Soperton	---	Amur maple, Siberian peashrub, lilac, gray dogwood, northern whitecedar.	White spruce, Norway spruce, Black Hills spruce.	Eastern white pine, red pine, white ash.	---
Mudlake	---	Silky dogwood, northern whitecedar, nannyberry viburnum, redosier dogwood, lilac, American cranberrybush.	White spruce	Red maple, eastern white pine, white ash, silver maple.	---
StB, StC, StD----- Stambaugh	---	Northern whitecedar, lilac, Amur maple, Siberian peashrub, American cranberrybush, gray dogwood, silky dogwood.	Norway spruce-----	Eastern white pine, red pine, jack pine.	---
TpA---------- Tipler	Manyflower cotoneaster.	Gray dogwood, silky dogwood, Siberian peashrub, American cranberrybush, Amur maple, lilac, northern whitecedar.	Norway spruce-----	Jack pine, red pine, eastern white pine.	---
VaB---------- Vanzile	---	Silky dogwood, American cranberrybush, gray dogwood, lilac, Amur maple, northern whitecedar.	Norway spruce, white spruce.	Eastern white pine, red pine, red maple, white ash.	---

Table 9.--Windbreaks and Environmental Plantings--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
VsB, VsC---------- Vilas	Manyflower cotoneaster.	Northern whitecedar, Amur maple, lilac, American cranberrybush, Siberian peashrub, silky dogwood, gray dogwood.	Norway spruce-----	Eastern white pine, red pine, jack pine.	---
WaC:					
Wabeno-----------	---	Siberian peashrub, Amur maple, lilac, northern whitecedar.	White spruce, Norway spruce, Black Hills spruce.	Eastern white pine, red pine, white ash.	---
Goodman----------	---	Amur maple, northern whitecedar, gray dogwood, lilac, American cranberrybush.	White spruce, Norway spruce, Black Hills spruce.	Eastern white pine, red pine, white ash, red maple.	---
WbB:					
Wabeno-----------	---	Siberian peashrub, Amur maple, lilac, northern whitecedar.	White spruce, Norway spruce, Black Hills spruce.	Eastern white pine, red pine, white ash.	---
Goodwit----------	---	Amur maple, northern whitecedar, gray dogwood, lilac, American cranberrybush.	White spruce, Norway spruce, Black Hills spruce.	Eastern white pine, red pine, white ash, red maple.	---
WdB:					
Wabeno-----------	---	Siberian peashrub, Amur maple, lilac, northern whitecedar.	White spruce, Norway spruce, Black Hills spruce.	Eastern white pine, red pine, white ash.	---
Mudlake----------	---	Silky dogwood, northern whitecedar, nannyberry viburnum, redosier dogwood, lilac, American cranberrybush.	White spruce------	Red maple, eastern white pine, white ash, silver maple.	---

Table 9.--Windbreaks and Environmental Plantings--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
WhA---------- Whisklake	---	Northern whitecedar, nannyberry viburnum, American cranberrybush, redosier dogwood, silky dogwood, lilac.	White spruce------	Eastern white pine, silver maple, red maple, white ash.	---
WrA---------- Worcester	---	Common ninebark, northern whitecedar, nannyberry viburnum, American cranberrybush, redosier dogwood, silky dogwood, lilac.	White spruce------	Eastern white pine, silver maple, red maple, white ash.	---
WtA---------- Wormet	---	Common ninebark, northern whitecedar, lilac, American cranberrybush, silky dogwood, redosier dogwood, nannyberry viburnum.	White spruce------	Eastern white pine, red maple, white ash, silver maple.	---

Table 10.--Recreational Development

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated)

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
ArB:					
Argonne	Moderate: small stones, wetness, percs slowly.	Moderate: wetness, small stones, percs slowly.	Severe: small stones.	Moderate: wetness.	Moderate: small stones, large stones, wetness.
Sarwet	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight	Moderate: small stones, large stones, droughty.
Au Au Gres	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Ca Capitola	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
CrA Croswell	Moderate: wetness, too sandy.	Moderate: wetness, too sandy.	Moderate: small stones, too sandy, wetness.	Moderate: too sandy.	Moderate: droughty.
CuA Cublake	Moderate: wetness, too sandy.	Moderate: wetness, too sandy.	Moderate: small stones, too sandy, wetness.	Moderate: too sandy.	Severe: droughty.
FeB Fence	Slight	Slight	Moderate: slope.	Severe: erodes easily.	Slight.
FlA Flink	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness, too sandy.	Moderate: wetness, droughty.
Fm Fordum	Severe: flooding, ponding.	Severe: ponding.	Severe: ponding, flooding.	Severe: ponding.	Severe: ponding, flooding.
GaA Gastrow	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Kr Kinross	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, excess humus.
LaC:					
Laona	Moderate: slope, small stones, percs slowly.	Moderate: slope, small stones, percs slowly.	Severe: slope, small stones.	Slight	Moderate: small stones, large stones, droughty.
Sarona	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Slight	Moderate: small stones, large stones, droughty.

Table 10.--Recreational Development--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
LaD:					
Laona	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
Sarona	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
Lo:					
Loxley	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
Beseman	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
Dawson	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
Lu:					
Lupton	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
Cathro	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
Markey	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
MaA Manitowish	Slight	Slight	Moderate: small stones.	Slight	Moderate: large stones, droughty.
MeD:					
Metonga	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
Rock outcrop.					
Mn Minocqua	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
MuB Mudlake	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
PaB Padus	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight	Moderate: small stones, large stones.
PaC Padus	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Slight	Moderate: small stones, large stones, slope.

Table 10.--Recreational Development--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
PaD Padus	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
PeB: Padus	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight	Moderate: small stones, large stones.
Pence	Slight	Slight	Moderate: slope, small stones.	Slight	Moderate: large stones, droughty.
PeC: Padus	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Slight	Moderate: small stones, large stones, slope.
Pence	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: large stones, droughty, slope.
PeD: Padus	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
Pence	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
PfD: Padus	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
Soperton	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
PgB: Padus	Slight	Slight	Moderate: slope.	Severe: erodes easily.	Moderate: large stones.
Wabeno	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, small stones, wetness.	Severe: erodes easily.	Moderate: large stones, wetness.
PgC: Padus	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: large stones, slope.
Wabeno	Moderate: slope, wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: large stones, wetness, slope.
PhB Padwood	Slight	Slight	Moderate: slope, small stones.	Slight	Moderate: large stones, droughty.

Table 10.--Recreational Development--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
PkE Pelissier	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: droughty, slope.
PnB Pence	Slight	Slight	Moderate: slope, small stones.	Slight	Moderate: large stones, droughty.
PnC Pence	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: large stones, droughty, slope.
PnD Pence	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
PsB: Pence	Slight	Slight	Moderate: slope, small stones.	Slight	Moderate: large stones, droughty.
Vilas	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, small stones, too sandy.	Moderate: too sandy.	Moderate: droughty.
PsC: Pence	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: large stones, droughty, slope.
Vilas	Moderate: slope, too sandy.	Moderate: slope, too sandy.	Severe: slope.	Moderate: too sandy.	Moderate: droughty, slope.
PsD: Pence	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Vilas	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Pt. Pits, gravel					
RuD Rubicon	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: droughty, slope.
SoD: Soperton	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
Goodman	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.

Table 10.--Recreational Development--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
SpD:					
Soperton	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
Mudlake	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
StB	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Severe: erodes easily.	Moderate: large stones.
StC	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: large stones, slope.
StD	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
TpA	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight	Moderate: small stones, large stones.
VaB	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Severe: erodes easily.	Moderate: large stones.
VsB	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, small stones, too sandy.	Moderate: too sandy.	Moderate: droughty.
VsC	Moderate: slope, too sandy.	Moderate: slope, too sandy.	Severe: slope.	Moderate: too sandy.	Moderate: droughty, slope.
WaC:					
Wabeno	Moderate: slope, wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: large stones, wetness, slope.
Goodman	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: large stones, slope.
WbB:					
Wabeno	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, small stones, wetness.	Severe: erodes easily.	Moderate: large stones, wetness.
Goodwit	Slight	Slight	Moderate: slope, small stones.	Severe: erodes easily.	Moderate: large stones.
WdB:					
Wabeno	Moderate: slope, wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: large stones, wetness, slope.

Table 10.--Recreational Development--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
WdB: Mudlake	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
WhA: Whisklake	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
WrA: Worcester	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
WtA: Wormet	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, droughty.

Table 11.--Wildlife Habitat

(See text for definitions of terms used in this table. Absence of an entry indicates that the soil was not rated)

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
ArB:										
Argonne	Very poor.	Poor	Good	Good	Good	Poor	Very poor.	Poor	Good	Very poor.
Sarwet	Very poor.	Poor	Good	Good	Good	Poor	Very poor.	Poor	Good	Very poor.
Au Au Gres	Poor	Fair	Good	Good	Good	Poor	Poor	Fair	Good	Poor.
Ca Capitola	Very poor.	Poor	Fair	Fair	Fair	Good	Good	Poor	Fair	Good.
CrA Croswell	Poor	Fair	Fair	Fair	Fair	Poor	Very poor.	Fair	Fair	Very poor.
CuA Cublake	Poor	Fair	Fair	Fair	Fair	Poor	Very poor.	Fair	Fair	Very poor.
FeB Fence	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
FlA Flink	Poor	Fair	Good	Good	Good	Poor	Poor	Fair	Good	Poor.
Fm Fordum	Very poor.	Very poor.	Poor	Fair	Fair	Good	Good	Very poor.	Fair	Good.
GaA Gastrow	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Kr Kinross	Very poor.	Poor	Poor	Fair	Fair	Good	Good	Poor	Fair	Good.
LaC, LaD:										
Laona	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
Sarona	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
Lo:										
Loxley	Very poor.	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
Beseman	Very poor.	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
Dawson	Very poor.	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
Lu:										
Lupton	Poor	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
Cathro	Poor	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
Markey	Poor	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.

Table 11.--Wildlife Habitat--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
MaA---------- Manitowish	Fair	Fair	Good	Good	Good	Poor	Poor	Fair	Good	Poor.
MeD:										
Metonga----------	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
Rock outcrop.										
Mn---------- Minocqua	Very poor.	Fair	Fair	Fair	Fair	Good	Good	Poor	Fair	Good.
MuB---------- Mudlake	Very poor.	Poor	Good	Good	Good	Poor	Very poor.	Poor	Good	Very poor.
PaB, PaC---------- Padus	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
PaD---------- Padus	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
PeB, PeC:										
Padus----------	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Pence----------	Fair	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
PeD:										
Padus----------	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Pence----------	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
PfD:										
Padus----------	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Soperton----------	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
PgB:										
Padus----------	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Wabeno----------	Very poor.	Poor	Good	Good	Good	Poor	Very poor.	Poor	Good	Very poor.
PgC:										
Padus----------	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Wabeno----------	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
PhB---------- Padwood	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
PkE---------- Pelissier	Very poor.	Very poor.	Poor	Poor	Poor	Very poor.	Very poor.	Very poor.	Poor	Very poor.

Table 11.--Wildlife Habitat--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
PnB, PnC---------- Pence	Fair	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
PnD---------- Pence	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
PsB, PsC:										
Pence----------	Fair	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
Vilas----------	Poor	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Fair	Poor	Very poor.
PsD:										
Pence----------	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
Vilas----------	Very poor.	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
Pt. Pits, gravel										
RuD---------- Rubicon	Very poor.	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
SoD:										
Soperton----------	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
Goodman----------	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
SpD:										
Soperton----------	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
Mudlake----------	Very poor.	Poor	Good	Good	Good	Poor	Very poor.	Poor	Good	Very poor.
StB---------- Stambaugh	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
StC---------- Stambaugh	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
StD---------- Stambaugh	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
TpA---------- Tipler	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
VaB---------- Vanzile	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
VsB, VsC---------- Vilas	Poor	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Fair	Poor	Very poor.

Table 11.--Wildlife Habitat--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herba-ceous plants	Hard-wood trees	Conif-erous plants	Wetland plants	Shallow water areas	Open-land wild-life	Wood-land wild-life	Wetland wild-life
WaC:										
Wabeno	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
Goodman	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
WbB:										
Wabeno	Very poor.	Poor	Good	Good	Good	Poor	Very poor.	Poor	Good	Very poor.
Goodwit	Very poor.	Poor	Good	Good	Good	Poor	Very poor.	Poor	Good	Very poor.
WdB:										
Wabeno	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
Mudlake	Very poor.	Poor	Good	Good	Good	Poor	Very poor.	Poor	Good	Very poor.
WhA Whisklake	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
WrA Worcester	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
WtA Wormet	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.

Table 12.--Building Site Development

(See text for definitions of terms used in this table. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
ArB:						
Argonne	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, frost action.	Moderate: small stones, large stones, wetness.
Sarwet	Severe: cutbanks cave.	Slight	Moderate: wetness.	Slight	Moderate: frost action.	Moderate: small stones, large stones, droughty.
Au	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Au Gres						
Ca	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, frost action.	Severe: ponding, excess humus.
Capitola						
CrA	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: droughty.
Croswell						
CuA	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Severe: droughty.
Cublake						
FeB	Severe: cutbanks cave.	Slight	Moderate: wetness.	Slight	Severe: frost action.	Slight.
Fence						
FlA	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Moderate: wetness, frost action.	Moderate: wetness, droughty.
Flink						
Fm	Severe: cutbanks cave, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: ponding, flooding, frost action.	Severe: ponding, flooding.
Fordum						
GaA	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, frost action.	Severe: wetness.
Gastrow						
Kr	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, excess humus.
Kinross						
LaC:						
Laona	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: small stones, large stones, droughty.
Sarona	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: small stones, large stones, droughty.

Table 12.--Building Site Development--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
LaD:						
Laona	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Sarona	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Lo:						
Loxley	Severe: excess humus, ponding.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding, frost action.	Severe: ponding, excess humus.
Beseman	Severe: excess humus, ponding.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding, frost action.	Severe: ponding, excess humus.
Dawson	Severe: cutbanks cave, excess humus, ponding.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding, frost action.	Severe: ponding, excess humus.
Lu:						
Lupton	Severe: excess humus, ponding.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding, frost action.	Severe: ponding, excess humus.
Cathro	Severe: excess humus, ponding.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding, frost action.	Severe: ponding, excess humus.
Markey	Severe: cutbanks cave, excess humus, ponding.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding, frost action.	Severe: ponding, excess humus.
MaA	Severe: cutbanks cave.	Slight	Moderate: wetness.	Slight	Slight	Moderate: large stones, droughty.
MeD:						
Metonga	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope.
Rock outcrop.						
Mn	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, frost action.	Severe: ponding, excess humus.
MuB	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, frost action.	Severe: wetness.
PaB	Severe: cutbanks cave.	Slight	Slight	Slight	Moderate: frost action.	Moderate: small stones, large stones.

Table 12.--Building Site Development--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
PaC---------- Padus	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: small stones, large stones, slope.
PaD---------- Padus	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
PeB:						
Padus----------	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Moderate: frost action.	Moderate: small stones, large stones.
Pence----------	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Slight---------	Moderate: large stones, droughty.
PeC:						
Padus----------	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: small stones, large stones, slope.
Pence----------	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: large stones, droughty, slope.
PeD:						
Padus----------	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Pence----------	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
PfD:						
Padus----------	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Soperton---------	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
PgB:						
Padus----------	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Moderate: frost action.	Moderate: large stones.
Wabeno----------	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, frost action.	Moderate: large stones, wetness.
PgC:						
Padus----------	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: large stones, slope.
Wabeno----------	Severe: cutbanks cave, wetness.	Moderate: wetness, slope.	Severe: wetness.	Severe: slope.	Moderate: wetness, slope, frost action.	Moderate: large stones, wetness, slope.

Table 12.--Building Site Development--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
PhB Padwood	Severe: cutbanks cave.	Slight	Moderate: wetness.	Slight	Moderate: frost action.	Moderate: large stones, droughty.
PkE Pelissier	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: droughty, slope.
PnB Pence	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: large stones, droughty.
PnC Pence	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: large stones, droughty, slope.
PnD Pence	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
PsB: Pence	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: large stones, droughty.
Vilas	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty.
PsC: Pence	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: large stones, droughty, slope.
Vilas	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope.
PsD: Pence	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Vilas	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Pt. Pits, gravel						
RuD Rubicon	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: droughty, slope.
SoD: Soperton	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Goodman	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.

Table 12.--Building Site Development--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
SpD:						
Soperton	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Mudlake	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, frost action.	Severe: wetness.
StB	Severe: cutbanks cave.	Slight	Slight	Slight	Moderate: frost action.	Moderate: large stones.
StC	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: large stones, slope.
StD	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
TpA	Severe: cutbanks cave.	Slight	Moderate: wetness.	Slight	Moderate: frost action.	Moderate: small stones, large stones.
VaB	Severe: cutbanks cave.	Slight	Slight	Slight	Moderate: frost action.	Moderate: large stones.
VsB	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty.
VsC	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope.
WaC:						
Wabeno	Severe: cutbanks cave, wetness.	Moderate: wetness, slope.	Severe: wetness.	Severe: slope.	Moderate: wetness, slope, frost action.	Moderate: large stones, wetness, slope.
Goodman	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: large stones, slope.
WbB:						
Wabeno	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, frost action.	Moderate: large stones, wetness.
Goodwit	Severe: cutbanks cave.	Slight	Moderate: wetness.	Slight	Moderate: frost action.	Moderate: large stones.
WdB:						
Wabeno	Severe: cutbanks cave, wetness.	Moderate: wetness, slope.	Severe: wetness.	Severe: slope.	Moderate: wetness, slope, frost action.	Moderate: large stones, wetness, slope.
Mudlake	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, frost action.	Severe: wetness.

Table 12.--Building Site Development--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
WhA---------- Whisklake	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, frost action.	Severe: wetness.
WrA---------- Worcester	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, frost action.	Severe: wetness.
WtA---------- Wormet	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, droughty.

Table 13.--Sanitary Facilities

(See text for definitions of terms used in this table. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
ArB:					
Argonne	Severe: wetness, percs slowly.	Severe: seepage.	Severe: seepage, wetness.	Moderate: wetness.	Poor: seepage, small stones.
Sarwet	Severe: wetness.	Severe: wetness.	Moderate: wetness, large stones.	Moderate: wetness.	Poor: small stones.
Au	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
Au Gres					
Ca	Severe: ponding, percs slowly.	Severe: excess humus, ponding.	Severe: ponding.	Severe: ponding.	Poor: seepage, small stones, ponding.
Capitola					
CrA	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy,
Croswell					
CuA	Severe: wetness, percs slowly, poor filter.	Severe: seepage, wetness.	Severe: too sandy.	Severe: seepage.	Poor: seepage, too sandy.
Cublake					
FeB	Severe: wetness, percs slowly.	Severe: wetness.	Severe: too sandy.	Moderate: wetness.	Fair: too sandy, wetness.
Fence					
FlA	Severe: wetness, percs slowly, poor filter.	Severe: seepage, wetness.	Severe: wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
Flink					
Fm	Severe: flooding, ponding, poor filter.	Severe: seepage, flooding.	Severe: flooding, seepage, ponding.	Severe: flooding, seepage, ponding.	Poor: seepage, too sandy, small stones.
Fordum					
GaA	Severe: wetness.	Severe: wetness.	Severe: wetness, too sandy.	Severe: wetness.	Poor: too sandy, wetness.
Gastrow					
Kr	Severe: ponding, poor filter.	Severe: seepage, excess humus, ponding.	Severe: seepage, ponding, too sandy.	Severe: seepage, ponding.	Poor: seepage, too sandy, ponding.
Kinross					
LaC:					
Laona	Severe: percs slowly.	Severe: slope.	Severe: seepage.	Moderate: slope.	Poor: seepage, small stones.

Table 13.--Sanitary Facilities--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
LaC:					
Sarona	Moderate: percs slowly, slope.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Poor: small stones.
LaD:					
Laona	Severe: percs slowly, slope.	Severe: slope.	Severe: seepage, slope.	Severe: slope.	Poor: seepage, small stones, slope.
Sarona	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: small stones, slope.
Lo:					
Loxley	Severe: subsides, ponding, percs slowly.	Severe: seepage, excess humus, ponding.	Severe: seepage, ponding, excess humus.	Severe: seepage, ponding.	Poor: ponding, excess humus.
Beseman	Severe: subsides, ponding, percs slowly.	Severe: seepage, excess humus, ponding.	Severe: ponding, excess humus.	Severe: seepage, ponding.	Poor: ponding, excess humus.
Dawson	Severe: subsides, ponding, percs slowly.	Severe: seepage, excess humus, ponding.	Severe: seepage, ponding, excess humus.	Severe: seepage, ponding.	Poor: ponding, excess humus.
Lu:					
Lupton	Severe: subsides, ponding, percs slowly.	Severe: seepage, excess humus, ponding.	Severe: seepage, ponding, excess humus.	Severe: seepage, ponding.	Poor: ponding, excess humus.
Cathro	Severe: ponding, percs slowly.	Severe: seepage, excess humus, ponding.	Severe: ponding.	Severe: seepage, ponding.	Poor: ponding.
Markey	Severe: subsides, ponding, percs slowly.	Severe: seepage, excess humus, ponding.	Severe: seepage, ponding, too sandy.	Severe: seepage, ponding.	Poor: seepage, too sandy, ponding.
MaA	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, small stones.
MeD:					
Metonga	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.
Rock outcrop.					
Mn	Severe: ponding, poor filter.	Severe: seepage, excess humus, ponding.	Severe: seepage, ponding, too sandy.	Severe: seepage, ponding.	Poor: seepage, too sandy, small stones.

Table 13.--Sanitary Facilities--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
MuB---------- Mudlake	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Poor: seepage, small stones, wetness.
PaB---------- Padus	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
PaC---------- Padus	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
PaD---------- Padus	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, small stones.
PeB: Padus----------	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
Pence----------	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
PeC: Padus----------	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
Pence----------	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
PeD: Padus----------	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, small stones.
Pence----------	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, small stones.
PfD: Padus----------	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, small stones.
Soperton----------	Severe: percs slowly, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: seepage, small stones, slope.

Table 13.--Sanitary Facilities--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
PgB:					
Padus	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
Wabeno	Severe: wetness, percs slowly.	Moderate: seepage, slope.	Severe: wetness.	Moderate: wetness.	Poor: seepage, small stones.
PgC:					
Padus	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
Wabeno	Severe: wetness, percs slowly.	Severe: slope.	Severe: wetness.	Moderate: wetness, slope.	Poor: seepage, small stones.
PhB Padwood	Severe: wetness, percs slowly, poor filter.	Severe: seepage, wetness.	Severe: too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
PkE Pelissier	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, small stones.
PnB Pence	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
PnC Pence	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
PnD Pence	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, small stones.
PsB:					
Pence	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
Vilas	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
PsC:					
Pence	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
Vilas	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.

Table 13.--Sanitary Facilities--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
PsD:					
Pence	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, small stones.
Vilas	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.
Pt.					
Pits, gravel					
RuD	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.
Rubicon					
SoD:					
Soperton	Severe: percs slowly, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: seepage, small stones, slope.
Goodman	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: slope.	Poor: seepage, small stones, slope.
SpD:					
Soperton	Severe: percs slowly, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: seepage, small stones, slope.
Mudlake	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Poor: seepage, small stones, wetness.
StB	Severe: percs slowly, poor filter.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: seepage, too sandy, small stones.
Stambaugh					
StC	Severe: percs slowly, poor filter.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Poor: seepage, too sandy, small stones.
Stambaugh					
StD	Severe: percs slowly, poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: seepage, too sandy, small stones.
Stambaugh					
TpA	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, small stones.
Tipler					

Table 13.--Sanitary Facilities--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
VaB Vanzile	Severe: percs slowly, poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
VsB Vilas	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
VsC Vilas	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
WaC: Wabeno	Severe: wetness, percs slowly.	Severe: slope.	Severe: wetness.	Moderate: wetness, slope.	Poor: seepage, small stones.
Goodman	Moderate: percs slowly, slope.	Severe: seepage, slope.	Severe: seepage.	Moderate: slope.	Poor: seepage, small stones.
WbB: Wabeno	Severe: wetness, percs slowly.	Moderate: seepage, slope.	Severe: wetness.	Moderate: wetness.	Poor: seepage, small stones.
Goodwit	Severe: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Poor: small stones.
WdB: Wabeno	Severe: wetness, percs slowly.	Severe: slope.	Severe: wetness.	Moderate: wetness, slope.	Poor: seepage, small stones.
Mudlake	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Poor: seepage, small stones, wetness.
WhA Whisklake	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, small stones.
WrA Worcester	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, small stones.
WtA Wormet	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, small stones.

Table 14.--Construction Materials

(See text for definitions of terms used in this table. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
ArB:				
Argonne	Fair: wetness.	Probable	Probable	Poor: small stones, area reclaim.
Sarwet	Fair: wetness.	Probable	Probable	Poor: small stones, area reclaim.
Au	Poor: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, wetness.
Au Gres				
Ca	Poor: wetness.	Probable	Probable	Poor: small stones, area reclaim, wetness.
Capitola				
CrA	Fair: wetness.	Probable	Improbable: too sandy.	Poor: too sandy.
Croswell				
CuA	Fair: wetness.	Improbable: thin layer.	Improbable: too sandy.	Poor: too sandy.
Cublake				
FeB	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy.
Fence				
FlA	Fair: wetness.	Improbable: thin layer.	Improbable: too sandy.	Poor: too sandy.
Flink				
Fm	Poor: wetness.	Probable	Probable	Poor: small stones, area reclaim, wetness.
Fordum				
GaA	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Gastrow				
Kr	Poor: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, wetness.
Kinross				
LaC:				
Laona	Good	Probable	Probable	Poor: small stones, area reclaim.
Sarona	Good	Probable	Probable	Poor: small stones, area reclaim.
LaD:				
Laona	Poor: slope.	Probable	Probable	Poor: small stones, area reclaim, slope.

Table 14.--Construction Materials--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
LaD:				
Sarona	Poor: slope.	Probable	Probable	Poor: small stones, area reclaim, slope.
Lo:				
Loxley	Poor: wetness.	Improbable: excess humus.	Improbable: excess humus.	Poor: excess humus, wetness.
Beseman	Poor: wetness.	Improbable: excess humus.	Improbable: excess humus.	Poor: excess humus, wetness.
Dawson	Poor: wetness.	Probable	Improbable: too sandy.	Poor: excess humus, wetness.
Lu:				
Lupton	Poor: wetness.	Improbable: excess humus.	Improbable: excess humus.	Poor: excess humus, wetness.
Cathro	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.
Markey	Poor: wetness.	Probable	Improbable: too sandy.	Poor: excess humus, wetness.
MaA	Fair: wetness.	Probable	Probable	Poor: too sandy, small stones, area reclaim.
Manitowish				
MeD:				
Metonga	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Rock outcrop.				
Mn	Poor: wetness.	Probable	Probable	Poor: too sandy, small stones, area reclaim.
Minocqua				
MuB	Poor: wetness.	Probable	Probable	Poor: small stones, area reclaim, wetness.
Mudlake				
PaB, PaC	Good	Probable	Probable	Poor: small stones, area reclaim.
Padus				
PaD	Poor: slope.	Probable	Probable	Poor: small stones, area reclaim, slope.
Padus				

Table 14.--Construction Materials--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
PeB, PeC:				
Padus	Good	Probable	Probable	Poor: small stones, area reclaim.
Pence	Good	Probable	Probable	Poor: too sandy, small stones, area reclaim.
PeD:				
Padus	Poor: slope.	Probable	Probable	Poor: small stones, area reclaim, slope.
Pence	Poor: slope.	Probable	Probable	Poor: too sandy, small stones, area reclaim.
PfD:				
Padus	Poor: slope.	Probable	Probable	Poor: small stones, area reclaim, slope.
Soperton	Poor: slope.	Probable	Probable	Poor: small stones, area reclaim, slope.
PgB, PgC:				
Padus	Good	Probable	Probable	Poor: small stones, area reclaim.
Wabeno	Fair: wetness.	Probable	Probable	Poor: small stones, area reclaim.
PhB Padwood	Fair: wetness.	Improbable: thin layer.	Improbable: thin layer.	Poor: small stones.
PkE Pelissier	Poor: slope.	Probable	Probable	Poor: too sandy, small stones, area reclaim.
PnB, PnC Pence	Good	Probable	Probable	Poor: too sandy, small stones, area reclaim.
PnD Pence	Poor: slope.	Probable	Probable	Poor: too sandy, small stones, area reclaim.

Table 14.--Construction Materials--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
PsB, PsC:				
Pence	Good	Probable	Probable	Poor: too sandy, small stones, area reclaim.
Vilas	Good	Probable	Improbable: too sandy.	Poor: too sandy.
PsD:				
Pence	Poor: slope.	Probable	Probable	Poor: too sandy, small stones, area reclaim.
Vilas	Poor: slope.	Probable	Improbable: too sandy.	Poor: too sandy, slope.
Pt.				
Pits, gravel				
RuD	Poor: slope.	Probable	Improbable: too sandy.	Poor: too sandy, slope.
Rubicon				
SoD:				
Soperton	Poor: slope.	Probable	Probable	Poor: small stones, area reclaim, slope.
Goodman	Poor: slope.	Probable	Probable	Poor: small stones, area reclaim, slope.
SpD:				
Soperton	Poor: slope.	Probable	Probable	Poor: small stones, area reclaim, slope.
Mudlake	Poor: wetness.	Probable	Probable	Poor: small stones, area reclaim, wetness.
StB, StC	Good	Probable	Probable	Poor: small stones, area reclaim.
Stambaugh				
StD	Fair: slope.	Probable	Probable	Poor: small stones, area reclaim, slope.
Stambaugh				
TpA	Fair: wetness.	Probable	Probable	Poor: small stones, area reclaim.
Tipler				

Table 14.--Construction Materials--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
VaB Vanzile	Good	Probable	Probable	Poor: small stones, area reclaim.
VsB, VsC Vilas	Good	Probable	Improbable: too sandy.	Poor: too sandy.
WaC: Wabeno	Fair: wetness.	Probable	Probable	Poor: small stones, area reclaim.
Goodman	Good	Probable	Probable	Poor: small stones, area reclaim.
WbB: Wabeno	Fair: wetness.	Probable	Probable	Poor: small stones, area reclaim.
Goodwit	Fair: wetness.	Probable	Probable	Poor: small stones, area reclaim.
WdB: Wabeno	Fair: wetness.	Probable	Probable	Poor: small stones, area reclaim.
Mudlake	Poor: wetness.	Probable	Probable	Poor: small stones, area reclaim, wetness.
WhA Whisklake	Poor: wetness.	Probable	Probable	Poor: small stones, area reclaim, wetness.
WrA Worcester	Poor: wetness.	Probable	Probable	Poor: small stones, area reclaim, wetness.
WtA Wormet	Poor: wetness.	Probable	Probable	Poor: too sandy, small stones, area reclaim.

Table 15.--Water Management

(See text for definitions of terms used in this table. Absence of an entry indicates that the soil was not evaluated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
ArB:						
Argonne	Severe: seepage.	Severe: seepage.	Percs slowly, large stones, slope.	Slope, wetness, soil blowing.	Large stones, wetness.	Large stones, rooting depth.
Sarwet	Moderate: seepage, slope.	Severe: seepage, piping.	Slope	Slope, wetness, droughty.	Large stones, wetness, soil blowing.	Large stones, droughty, rooting depth.
Au	Severe: seepage.	Severe: seepage, piping, wetness.	Cutbanks cave	Wetness, droughty.	Wetness, too sandy, soil blowing.	Wetness, droughty.
Au Gres						
Ca	Moderate: seepage.	Severe: seepage, piping, ponding.	Ponding, frost action, cutbanks cave.	Ponding, soil blowing, rooting depth.	Large stones, erodes easily, ponding.	Large stones, wetness, erodes easily.
Capitola						
CrA	Severe: seepage.	Severe: seepage, piping.	Cutbanks cave	Wetness, droughty.	Wetness, too sandy, soil blowing.	Droughty.
Croswell						
CuA	Severe: seepage.	Severe: seepage, piping.	Cutbanks cave	Wetness, droughty.	Wetness, too sandy, soil blowing.	Droughty.
Cublake						
FeB	Moderate: seepage, slope.	Severe: piping.	Frost action, slope, cutbanks cave.	Slope, wetness, erodes easily.	Erodes easily, wetness.	Erodes easily.
Fence						
FlA	Severe: seepage.	Severe: seepage, piping.	Cutbanks cave	Wetness, droughty.	Wetness, too sandy, soil blowing.	Wetness, droughty.
Flink						
Fm	Severe: seepage.	Severe: seepage, piping, ponding.	Ponding, flooding, frost action.	Ponding, droughty, flooding.	Erodes easily, ponding, too sandy.	Wetness, erodes easily, droughty.
Fordum						
GaA	Moderate: seepage.	Severe: piping, wetness.	Frost action, cutbanks cave.	Wetness, erodes easily.	Erodes easily, wetness, too sandy.	Wetness, erodes easily.
Gastrow						
Kr	Severe: seepage.	Severe: seepage, piping, ponding.	Ponding, cutbanks cave.	Ponding	Ponding, too sandy, soil blowing.	Wetness.
Kinross						
LaC, LaD:						
Laona	Severe: slope.	Severe: seepage.	Deep to water	Slope, droughty, soil blowing.	Slope, large stones, rooting depth.	Large stones, slope, droughty.
Sarona	Severe: seepage, slope.	Severe: seepage, piping.	Deep to water	Slope, droughty.	Slope, too sandy, soil blowing.	Slope, droughty.

Table 15.--Water Management--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
Lo:						
Loxley	Severe: seepage.	Severe: excess humus, ponding.	Ponding, subsides, frost action.	Ponding	Ponding	Wetness.
Beseman	Severe: seepage.	Severe: excess humus, ponding.	Ponding, subsides, frost action.	Ponding, rooting depth.	Ponding	Wetness, rooting depth.
Dawson	Severe: seepage.	Severe: excess humus, ponding.	Ponding, subsides, frost action.	Ponding, rooting depth.	Ponding	Wetness, rooting depth.
Lu:						
Lupton	Severe: seepage.	Severe: excess humus, ponding.	Ponding, subsides, frost action.	Ponding, soil blowing.	Ponding, soil blowing.	Wetness.
Cathro	Severe: seepage.	Severe: piping, ponding.	Ponding, subsides, frost action.	Ponding, soil blowing.	Ponding, soil blowing.	Wetness.
Markey	Severe: seepage.	Severe: seepage, piping, ponding.	Ponding, subsides, frost action.	Ponding, soil blowing.	Ponding, too sandy, soil blowing.	Wetness.
MaA Manitowish	Severe: seepage.	Severe: seepage.	Cutbanks cave	Wetness, droughty, soil blowing.	Wetness, too sandy, soil blowing.	Droughty.
MeD:						
Metonga	Severe: slope.	Severe: piping.	Deep to water	Slope, soil blowing, depth to rock.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
Rock outcrop.						
Mn Minocqua	Severe: seepage.	Severe: seepage, piping, ponding.	Ponding, frost action, cutbanks cave.	Ponding, rooting depth.	Erodes easily, ponding, too sandy.	Wetness, erodes easily.
MuB Mudlake	Severe: seepage.	Severe: seepage, piping, wetness.	Frost action, slope, cutbanks cave.	Slope, wetness, erodes easily.	Large stones, erodes easily, wetness.	Large stones, wetness, erodes easily.
PaB Padus	Severe: seepage.	Severe: seepage, piping.	Deep to water	Slope, droughty, soil blowing.	Too sandy, soil blowing.	Droughty, rooting depth.
PaC, PaD Padus	Severe: seepage, slope.	Severe: seepage, piping.	Deep to water	Slope, droughty, soil blowing.	Slope, too sandy, soil blowing.	Slope, droughty, rooting depth.
PeB:						
Padus	Severe: seepage.	Severe: seepage, piping.	Deep to water	Slope, droughty, soil blowing.	Too sandy, soil blowing.	Droughty, rooting depth.
Pence	Severe: seepage.	Severe: seepage.	Deep to water	Slope, droughty.	Too sandy, soil blowing.	Droughty, rooting depth.

Table 15.--Water Management--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
PeC, PeD:						
Padus	Severe: seepage, slope.	Severe: seepage, piping.	Deep to water	Slope, droughty, soil blowing.	Slope, too sandy, soil blowing.	Slope, droughty, rooting depth.
Pence	Severe: seepage, slope.	Severe: seepage.	Deep to water	Slope, droughty.	Slope, too sandy, soil blowing.	Slope, droughty, rooting depth.
PfD:						
Padus	Severe: seepage, slope.	Severe: seepage, piping.	Deep to water	Slope, droughty, rooting depth.	Slope, erodes easily, too sandy.	Slope, erodes easily, droughty.
Soperton	Severe: seepage, slope.	Severe: seepage.	Deep to water	Slope, droughty, percs slowly.	Slope, large stones, erodes easily.	Large stones, slope, erodes easily.
PgB:						
Padus	Severe: seepage.	Severe: seepage, piping.	Deep to water	Slope, droughty, rooting depth.	Erodes easily, too sandy.	Erodes easily, droughty, rooting depth.
Wabeno	Moderate: seepage, slope.	Severe: seepage.	Percs slowly, large stones, slope.	Slope, wetness, droughty.	Large stones, erodes easily.	Large stones, erodes easily.
PgC:						
Padus	Severe: seepage, slope.	Severe: seepage, piping.	Deep to water	Slope, droughty, rooting depth.	Slope, erodes easily, too sandy.	Slope, erodes easily, droughty.
Wabeno	Severe: slope.	Severe: seepage.	Percs slowly, large stones, slope.	Slope, wetness, droughty.	Slope, large stones, erodes easily.	Large stones, slope, erodes easily.
PhB Padwood	Severe: seepage.	Severe: seepage, piping.	Slope, cutbanks cave.	Slope, wetness, droughty.	Wetness, too sandy.	Droughty, rooting depth.
PkE Pelissier	Severe: seepage, slope.	Severe: seepage.	Deep to water	Slope, droughty, soil blowing.	Slope, too sandy, soil blowing.	Slope, droughty.
PnB Pence	Severe: seepage.	Severe: seepage.	Deep to water	Slope, droughty.	Too sandy, soil blowing.	Droughty, rooting depth.
PnC, PnD Pence	Severe: seepage, slope.	Severe: seepage.	Deep to water	Slope, droughty.	Slope, too sandy, soil blowing.	Slope, droughty, rooting depth.
PsB:						
Pence	Severe: seepage.	Severe: seepage.	Deep to water	Slope, droughty.	Too sandy, soil blowing.	Droughty, rooting depth.
Vilas	Severe: seepage.	Severe: seepage, piping.	Deep to water	Slope, droughty, fast intake.	Too sandy, soil blowing.	Droughty.

Table 15.--Water Management--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
PsC, PsD:						
Pence	Severe: seepage, slope.	Severe: seepage.	Deep to water	Slope, droughty.	Slope, too sandy, soil blowing.	Slope, droughty, rooting depth.
Vilas	Severe: seepage, slope.	Severe: seepage, piping.	Deep to water	Slope, droughty, fast intake.	Slope, too sandy, soil blowing.	Slope, droughty.
Pt.						
Pits, gravel						
RuD	Severe: seepage, slope.	Severe: seepage, piping.	Deep to water	Slope, droughty, fast intake.	Slope, too sandy, soil blowing.	Slope, droughty.
Rubicon						
SoD:						
Soperton	Severe: seepage, slope.	Severe: seepage.	Deep to water	Slope, droughty, percs slowly.	Slope, large stones, erodes easily.	Large stones, slope, erodes easily.
Goodman	Severe: seepage, slope.	Severe: seepage, piping.	Deep to water	Slope, erodes easily.	Slope, erodes easily, too sandy.	Slope, erodes easily.
SpD:						
Soperton	Severe: seepage, slope.	Severe: seepage.	Deep to water	Slope, droughty, percs slowly.	Slope, large stones, erodes easily.	Large stones, slope, erodes easily.
Mudlake	Severe: seepage.	Severe: seepage, piping, wetness.	Frost action, slope, cutbanks cave.	Slope, wetness, erodes easily.	Large stones, erodes easily, wetness.	Large stones, wetness, erodes easily.
StB	Severe: seepage.	Severe: seepage, piping.	Deep to water	Slope, erodes easily.	Erodes easily, too sandy.	Erodes easily.
Stambaugh						
StC, StD	Severe: seepage, slope.	Severe: seepage, piping.	Deep to water	Slope, erodes easily.	Slope, erodes easily, too sandy.	Slope, erodes easily.
Stambaugh						
TpA	Severe: seepage.	Severe: seepage, piping.	Cutbanks cave	Wetness, droughty, soil blowing.	Wetness, too sandy, soil blowing.	Droughty, rooting depth.
Tipler						
VaB	Severe: seepage.	Severe: seepage, piping.	Deep to water	Slope, rooting depth, erodes easily.	Erodes easily, too sandy.	Erodes easily, rooting depth.
Vanzile						
VsB	Severe: seepage.	Severe: seepage, piping.	Deep to water	Slope, droughty, fast intake.	Too sandy, soil blowing.	Droughty.
Vilas						
VsC	Severe: seepage, slope.	Severe: seepage, piping.	Deep to water	Slope, droughty, fast intake.	Slope, too sandy, soil blowing.	Slope, droughty.
Vilas						

Table 15.--Water Management--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
WaC:						
Wabeno	Severe: slope.	Severe: seepage.	Percs slowly, large stones, slope.	Slope, wetness, droughty.	Slope, large stones, erodes easily.	Large stones, slope, erodes easily.
Goodman	Severe: seepage, slope.	Severe: seepage, piping.	Deep to water	Slope, erodes easily.	Slope, erodes easily, too sandy.	Slope, erodes easily.
WbB:						
Wabeno	Moderate: seepage, slope.	Severe: seepage.	Percs slowly, large stones, slope.	Slope, wetness, droughty.	Large stones, erodes easily.	Large stones, erodes easily.
Goodwit	Moderate: seepage, slope.	Severe: seepage, piping.	Slope	Slope, wetness, erodes easily.	Erodes easily, wetness.	Erodes easily.
WdB:						
Wabeno	Severe: slope.	Severe: seepage.	Percs slowly, large stones, slope.	Slope, wetness, droughty.	Slope, large stones, erodes easily.	Large stones, slope, erodes easily.
Mudlake	Severe: seepage.	Severe: seepage, piping, wetness.	Frost action, slope, cutbanks cave.	Slope, wetness, erodes easily.	Large stones, erodes easily, wetness.	Large stones, wetness, erodes easily.
WhA Whisklake	Severe: seepage.	Severe: seepage, piping, wetness.	Frost action, cutbanks cave.	Wetness, rooting depth, erodes easily.	Erodes easily, wetness, too sandy.	Wetness, erodes easily, rooting depth.
WrA Worcester	Severe: seepage.	Severe: seepage, piping, wetness.	Frost action, cutbanks cave.	Wetness, droughty, soil blowing.	Wetness, too sandy, soil blowing.	Wetness, droughty, rooting depth.
WtA Wormet	Severe: seepage.	Severe: seepage, piping, wetness.	Cutbanks cave	Wetness, droughty, soil blowing.	Wetness, too sandy, soil blowing.	Wetness, droughty, rooting depth.

Table 16.--Engineering Index Properties

(Absence of an entry indicates that data were not estimated)

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 10 inches	Frag-ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO			4	10	40	200		
	In				Pct	Pct					Pct	
ArB:												
Argonne------	0-5	Sandy loam----	SM	A-4, A-2-4	2-3	0-15	90-100	70-100	45-90	20-50	<21	NP-4
	5-15	Sandy loam, loam, fine sandy loam.	SM, SC-SM, ML, CL-ML	A-4, A-2-4	2-5	0-15	90-100	70-100	45-95	20-80	<23	NP-6
	15-29	Sandy loam, fine sandy loam.	SM, SC-SM	A-4, A-2-4	1-5	0-15	90-100	70-100	50-90	25-50	<23	NP-6
	29-39	Sandy loam, gravelly sandy loam.	SM, SC	A-4, A-2-4, A-1-b	0-5	0-30	65-95	60-90	35-70	15-45	<26	NP-8
	39-54	Sandy loam, loamy sand, gravelly sandy loam.	SM, SC-SM, SP-SM	A-4, A-2-4, A-1-b	0-5	0-30	65-95	60-90	25-70	9-45	<25	NP-7
	54-82	Gravelly sandy loam, sandy loam, gravelly loamy sand.	SM, SP-SM	A-4, A-2-4, A-1-b	0-5	0-30	65-95	60-90	25-70	9-45	<21	NP-4
Sarwet-------	0-1	Sandy loam----	SM, SC-SM	A-2, A-4, A-1	2-3	0-25	55-100	50-98	30-90	15-50	<25	NP-7
	1-3	Sandy loam, gravelly sandy loam, loam.	SM, SC-SM, ML, CL-ML	A-2, A-4, A-1	2-3	0-25	55-100	50-98	30-95	15-80	<25	NP-7
	3-18	Fine sandy loam, sandy loam, gravelly loam.	SM, SC-SM, ML, CL-ML	A-2, A-4, A-1	1-5	0-25	55-100	50-98	30-95	15-80	<25	NP-7
	18-27	Fine sandy loam, sandy loam, gravelly loamy sand.	SM, SC-SM, SP-SM	A-2, A-1, A-4	1-5	0-25	55-100	50-98	20-90	7-50	<25	NP-7
	27-48	Sandy loam, gravelly fine sandy loam.	SM, SC-SM	A-2, A-1, A-4	0-5	0-25	55-100	50-98	30-90	15-50	<28	NP-9
	48-60	Sandy loam, gravelly loamy sand.	SM, SC-SM, SP-SM	A-2, A-1, A-4	0-5	0-25	55-100	50-98	20-80	7-50	<25	NP-7
Au------------ Au Gres	0-4	Loamy sand----	SM, SP-SM, SC-SM	A-2-4, A-1-b	0	0	95-100	75-100	35-75	10-30	0-25	NP-7
	4-29	Sand, loamy sand.	SP-SM, SM, SC-SM, SP	A-2-4, A-3, A-1-b	0	0	95-100	75-100	35-75	0-30	0-25	NP-7
	29-60	Sand----------	SP-SM, SM, SP	A-3, A-2-4, A-1-b	0	0	95-100	75-100	35-70	0-15	0-14	NP

Table 16.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 10 inches	Frag-ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO			4	10	40	200		
	In				Pct	Pct					Pct	
Ca	0-5	Muck	PT	A-8	2-3	0-15	---	---	---	---	---	NP
Capitola	5-22	Silt loam, loam, sandy loam.	CL, ML, SM, SC	A-4, A-2-4	0-5	0-15	80-100	75-100	45-100	20-90	<28	NP-9
	22-36	Fine sandy loam, sandy loam, gravelly sandy loam.	SM, SC	A-4, A-1-b, A-2-4	0-10	0-25	65-100	55-95	35-85	15-50	<26	NP-8
	36-60	Fine sandy loam, sandy loam, gravelly loamy sand.	SM, SP-SM	A-4, A-1-b, A-2-4	0-10	0-25	65-100	55-95	20-85	8-50	<21	NP-4
CrA	0-3	Loamy sand	SM, SP-SM, SC-SM	A-2, A-1-b	0	0	90-100	75-100	40-75	10-30	0-25	NP-7
Croswell	3-28	Sand, loamy sand.	SP-SM, SM, SP	A-3, A-2-4, A-1-b	0	0	90-100	75-100	40-75	3-30	0-14	NP
	28-60	Sand	SP-SM, SM, SP	A-3, A-2-4, A-1-b	0	0	90-100	75-100	40-70	3-15	0-14	NP
CuA	0-4	Loamy sand	SM, SP-SM	A-2-4, A-1-b	0	0	80-100	75-100	30-75	10-35	<20	NP-4
Cublake	4-5	Loamy sand, sand, loamy fine sand.	SM, SP-SM	A-4, A-2-4, A-3, A-1-b	0	0	80-100	75-100	20-95	5-50	<20	NP-4
	5-21	Loamy sand, sand, loamy fine sand.	SM, SP-SM	A-4, A-2-4, A-3, A-1-b	0	0	80-100	75-100	20-95	5-50	<20	NP-4
	21-49	Sand, fine sand, loamy sand.	SM, SP-SM	A-3, A-1-b	0	0	80-100	75-100	20-85	5-35	---	NP
	49-60	Stratified sandy loam to silt loam.	SC, SC-SM, CL, CL-ML	A-4, A-6, A-2-4, A-2-6	0	0	95-100	90-100	50-85	25-60	20-35	4-15

Table 16.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 10 inches	Frag-ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO			4	10	40	200		
	In				Pct	Pct					Pct	
FeB---------- Fence	0-2	Silt loam-----	ML, CL-ML, CL	A-4	0	0	100	96-100	90-100	80-100	20-30	3-9
	2-3	Silt loam, very fine sandy loam, silt.	ML, CL-ML	A-4	0	0	100	96-100	90-100	80-100	<25	NP-7
	3-9	Silt loam, fine sandy loam, loamy very fine sand.	ML, CL-ML	A-4	0	0	100	96-100	90-100	80-100	15-25	NP-7
	9-17	Silt loam, very fine sandy loam, silt.	ML, CL-ML	A-4	0	0	100	96-100	90-100	80-100	15-25	NP-7
	17-42	Silt loam, very fine sandy loam, loamy very fine sand.	ML, CL-ML, CL	A-4	0	0	100	96-100	85-100	70-100	20-30	3-9
	42-60	Stratified silt to very fine sand.	ML, CL-ML	A-4	0	0	100	96-100	75-100	50-90	15-25	NP-7
FlA---------- Flink	0-3	Loamy sand----	SM, SM	A-1-b	0	0	90-100	85-100	35-75	15-35	---	NP
	3-29	Sand, loamy sand.	SM, SP-SM	A-3, A-1-b	0	0	90-100	85-100	25-75	5-35	---	NP
	29-44	Sand----------	SM, SP-SM	A-3, A-1-b	0	0	90-100	85-100	25-70	5-25	---	NP
	44-61	Stratified silty clay loam to sand.	SC, SC-SM, CL, CL-ML	A-4, A-6, A-2-4, A-2-6	0	0	90-100	85-100	50-85	25-60	20-35	4-15
Fm---------- Fordum	0-6	Loam----------	ML, CL, SM, SC	A-4, A-6	0	0-15	80-100	75-100	55-100	45-85	20-35	3-15
	6-26	Silt loam, sandy loam, gravelly loam.	SM, SC, ML, CL	A-2, A-4, A-1	0	0-15	30-100	25-100	20-100	10-90	<30	3-10
	26-60	Sand, gravelly sand.	SP, SM, GP, SM	A-3, A-2, A-1	0	0-15	30-100	25-100	7-95	1-50	---	NP
GaA---------- Gastrow	0-3	Silt loam-----	ML, CL-ML	A-4	0	0	100	100	80-100	60-90	0-25	NP-7
	3-5	Silt loam, very fine sandy loam.	ML, CL-ML	A-4	0	0	100	100	80-100	50-65	0-25	NP-7
	5-13	Silt loam, very fine sandy loam.	ML, CL-ML	A-4	0	0	100	100	80-100	50-70	0-25	NP-7
	13-29	Silt loam, very fine sandy loam.	ML, CL-ML	A-4	0	0	100	100	80-100	50-80	0-25	NP-7
	29-40	Fine sandy loam, silt loam, very fine sandy loam.	ML, CL-ML	A-4	0	0	100	100	75-100	50-80	18-25	3-7
	40-60	Stratified silt loam to fine sand.	SM, SC-SM, ML, CL-ML	A-4	0	0	100	100	65-95	35-80	0-25	NP-7

Table 16.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 10 inches	Frag-ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO			4	10	40	200		
	In				Pct	Pct					Pct	
Kr	0-6	Muck	PT	A-8	0	0	---	---	---	---	---	NP
Kinross	6-39	Sand, fine sand, loamy sand.	SP-SM, SM	A-3, A-2-4	0	0	100	90-100	50-80	5-30	---	NP
	39-60	Sand, fine sand.	SP-SM, SM	A-3, A-2-4	0	0	100	90-100	50-80	5-30	---	NP
LaC, LaD:												
Laona	0-3	Sandy loam	SM	A-4, A-2-4	2-3	0-15	90-100	70-100	50-90	25-50	<21	NP-4
	3-7	Sandy loam, fine sandy loam.	SM	A-4, A-2-4	2-5	0-15	90-100	70-100	50-90	25-50	<21	NP-4
	7-21	Sandy loam, loam, fine sandy loam.	SM, SC-SM, ML, CL-ML	A-4, A-2-4	1-5	0-15	90-100	70-100	50-95	25-80	<23	NP-6
	21-35	Gravelly sandy loam, fine sandy loam.	SM, SC	A-4, A-2-4, A-1-b	0-5	0-30	65-95	60-90	35-70	15-45	<26	NP-8
	35-70	Gravelly sandy loam, loamy sand.	SM, SC, SP-SM	A-4, A-2-4, A-1-b	0-5	0-30	65-95	60-90	25-70	9-45	<26	NP-8
	70-80	Gravelly sandy loam, sandy loam, gravelly loamy sand.	SM, SP-SM	A-4, A-2-4, A-1-b	0-5	0-30	65-95	60-90	25-70	9-45	<21	NP-4
Sarona	0-3	Sandy loam	SC-SM, SM	A-4, A-2-4, A-1-b	2-3	0-15	80-100	70-98	45-90	20-50	0-23	NP-6
	3-22	Fine sandy loam, sandy loam, gravelly loam.	SM, SC-SM, ML, CL-ML	A-2-4, A-4, A-1-b	2-3	0-15	55-100	50-98	30-90	13-55	0-23	NP-6
	22-47	Gravelly loamy sand, gravelly sandy loam, loamy sand.	SM, SC-SM	A-2-4, A-1-b, A-4	0-15	0-15	70-100	50-98	30-90	12-45	0-25	NP-7
	47-56	Gravelly loamy sand, fine sandy loam.	SM, SC-SM, SC	A-2-4, A-1-b, A-4	0-15	0-15	55-100	50-98	30-90	12-45	0-28	NP-9
	56-60	Gravelly sandy loam, loamy sand, gravelly loamy sand.	SM, SC-SM, SP-SM	A-2-4, A-1-b, A-4	0-15	0-15	55-100	50-98	20-90	7-45	0-25	NP-7
Lo:												
Loxley	0-12	Peat	PT	A-8	0	0	---	---	---	---	---	---
	12-60	Muck	PT	A-8	0	0	---	---	---	---	---	---
Beseman	0-12	Peat	PT	A-8	0	0	---	---	---	---	---	---
	12-36	Muck	PT	A-8	0	0	---	---	---	---	---	---
	36-60	Loam, sandy loam, silt loam.	CL, ML, SM, SC	A-2, A-4, A-6	0	0-2	75-100	65-100	40-95	25-75	15-30	NP-12

Table 16.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 10 inches	Frag-ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO			4	10	40	200		
	In				Pct	Pct					Pct	
Lo:												
Dawson-------	0-10	Peat----------	PT	A-8	0	0	---	---	---	---	---	---
	10-44	Muck----------	PT	A-8	0	0	---	---	---	---	---	---
	44-60	Sand, gravelly sand, very gravelly very fine sand.	SP, SM, SC, GP	A-2, A-3, A-1, A-4	0	0	45-100	35-100	15-90	0-45	<20	NP-10
Lu:												
Lupton-------	0-10	Muck----------	PT	A-8	0	0	---	---	---	---	---	---
	10-60	Muck----------	PT	A-8	0	0	---	---	---	---	---	---
Cathro-------	0-8	Muck----------	PT	A-8	0	0	---	---	---	---	---	---
	8-30	Muck----------	PT	A-8	0	0	---	---	---	---	---	---
	30-60	Loam, silt loam, sandy loam.	SC-SM, CL-ML, SC, CL	A-4, A-6	0	0-5	80-100	65-100	60-100	35-90	20-40	4-20
Markey-------	0-36	Muck----------	PT	A-8	0	0	---	---	---	---	---	---
	36-60	Sand, fine sand, gravelly loamy sand.	SP, SM, SP-SM	A-2, A-3, A-1	0	0	95-100	60-100	30-75	0-30	---	NP
MaA----------	0-2	Sandy loam----	SM, ML	A-4	0	0-15	80-100	75-100	50-85	35-55	<21	NP-4
Manitowish	2-4	Sandy loam, loam, gravelly fine sandy loam.	SM, SC-SM, ML, CL-ML	A-4, A-2-4	0	0-15	55-100	50-100	35-95	20-75	<25	NP-7
	4-16	Sandy loam, loam, gravelly fine sandy loam.	SM, SC-SM, ML, CL-ML	A-4, A-2-4	0	0-15	55-100	50-100	35-95	20-75	<25	NP-7
	16-22	Loamy sand, gravelly loamy sand, sand.	SM, SC-SM, GM, GM-GC	A-2, A-1, A-3, A-4	0	0-15	55-100	50-90	20-90	5-50	<25	NP-6
	22-60	Stratified sand to gravelly coarse sand.	SP, SP-SM	A-1, A-3, A-2	0	0-15	55-100	50-75	20-70	0-12	---	NP
MeD:												
Metonga------	0-3	Very fine sandy loam.	ML, CL-ML, SM, SC-SM	A-4	2-3	0-15	95-100	90-100	65-95	45-85	<25	NP-7
	3-4	Very fine sandy loam, silt loam, fine sandy loam.	SM, ML, SC-SM, CL-ML	A-4	2-3	0-15	95-100	90-100	65-95	35-85	<25	NP-7
	4-25	Very fine sandy loam, silt loam, fine sandy loam.	SM, ML, SC-SM, CL-ML	A-4	0-5	0-15	95-100	90-100	65-95	35-85	<25	NP-7
	25-28	Sandy loam, gravelly fine sandy loam.	SM	A-2-4, A-4, A-1-b	0-5	0-15	55-95	50-90	30-80	15-50	<20	NP-4
	28	Unweathered bedrock.	---	---	---	---	---	---	---	---	---	---
Rock outcrop-	0-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---	---

Table 16.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 10 inches	Frag-ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO			4	10	40	200		
	In				Pct	Pct					Pct	
Mn	0-4	Muck	PT	A-8	0	0	---	---	---	---	---	---
Minocqua	4-28	Silt loam, loam, gravelly loam.	SC, SM, CL, ML	A-2, A-4, A-6	0-1	0-9	80-100	75-100	45-100	25-90	<35	NP-13
	28-60	Sand, very gravelly sand, gravelly sand.	SP, SM, GP, GM	A-1, A-3, A-2	0-1	0-9	30-100	25-100	5-70	0-30	---	NP
MuB	0-5	Silt loam	ML, CL-ML	A-4	2-3	0-15	80-100	75-100	55-95	50-90	15-25	NP-6
Mudlake	5-9	Silt loam, silt.	ML, CL-ML	A-4	1-5	0-15	80-100	75-100	55-95	50-90	<25	NP-6
	9-16	Silt loam	ML, CL-ML	A-4	0-8	0-15	80-100	75-100	55-95	50-90	15-25	NP-6
	16-29	Silt loam	ML, CL-ML	A-4	0-8	0-15	80-100	75-100	55-95	50-90	15-25	NP-7
	29-35	Sandy loam, gravelly sandy loam, loam.	SM, SC, CL, ML	A-2-4, A-4, A-1-b	0-10	0-25	60-95	55-95	35-90	15-75	15-25	NP-9
	35-60	Sandy loam, loamy sand.	SM, SC-SM, SP-SM	A-2-4, A-4, A-1-b	0-10	0-25	60-95	55-95	20-75	8-45	15-25	NP-6
PaB, PaC, PaD-Padus	0-2	Sandy loam	SM	A-2, A-4, A-1-b	0	0-9	55-100	50-100	30-90	15-50	<21	NP-4
	2-4	Sandy loam, fine sandy loam, loam.	ML, CL-ML, SM, SC-SM	A-4, A-2, A-1-b	0	0-9	55-100	50-100	30-95	15-80	<23	NP-6
	4-16	Sandy loam, loam, fine sandy loam.	SM, SC, ML, CL	A-2, A-4, A-1-b	0	0-9	55-100	50-100	30-95	15-80	<26	NP-8
	16-25	Sandy loam, gravelly loam, fine sandy loam.	SM, SC, ML, CL	A-2, A-4, A-1	0	0-9	55-100	50-100	30-95	15-80	<28	NP-9
	25-60	Stratified sand to very gravelly coarse sand.	SP, SP-SM, GP, GP-GM	A-1, A-2, A-3	0	0-9	30-100	25-95	7-65	1-25	---	NP
PeB, PeC, PeD:												
Padus	0-2	Sandy loam	SM	A-2, A-4, A-1-b	0	0-9	55-100	50-100	30-90	15-50	<21	NP-4
	2-4	Sandy loam, fine sandy loam, loam.	ML, CL-ML, SM, SC-SM	A-4, A-2, A-1-b	0	0-9	55-100	50-100	30-95	15-80	<23	NP-6
	4-16	Sandy loam, loam, fine sandy loam.	SM, SC, ML, CL	A-2, A-4, A-1-b	0	0-9	55-100	50-100	30-95	15-80	<26	NP-8
	16-25	Sandy loam, gravelly loam, fine sandy loam.	SM, SC, ML, CL	A-2, A-4, A-1	0	0-9	55-100	50-100	30-95	15-80	<28	NP-9
	25-60	Stratified sand to very gravelly coarse sand.	SP, SP-SM, GP, GP-GM	A-1, A-2, A-3	0	0-9	30-100	25-95	7-65	1-25	---	NP

Table 16.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 10 inches	Frag-ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO			4	10	40	200		
	In				Pct	Pct					Pct	
PeB, PeC, PeD:												
Pence	0-4	Sandy loam	SM, ML	A-4, A-2-4, A-1-b	0	0-15	85-100	75-100	45-85	20-55	<21	NP-4
	4-16	Gravelly sandy loam, sandy loam, loam.	SM, ML, CL-ML, SC-SM	A-4, A-2-4, A-1-b	0-4	0-15	55-100	50-100	30-95	15-75	<25	NP-7
	16-22	Gravelly coarse sand, loamy sand, sand.	SM, SP-SM, GM, GP-GM	A-3, A-1-b	0-4	0-15	55-100	50-100	25-75	2-30	---	NP
	22-62	Gravelly sand, sand, very gravelly sand.	SP, SM	A-3, A-1-b	0-4	0-15	55-85	35-90	15-55	2-15	---	NP
PfD:												
Padus	0-2	Silt loam	ML, CL-ML	A-4	0	0-9	95-100	90-100	85-100	80-95	<26	NP-7
	2-3	Silt loam	ML, CL-ML	A-4	0	0-9	95-100	90-100	85-95	80-95	<23	NP-6
	3-12	Silt loam	ML, CL-ML	A-4	0	0-9	95-100	90-100	80-95	80-95	<26	NP-7
	12-28	Sandy loam, loam, fine sandy loam.	SM, SC, ML, CL	A-2, A-4, A-1	0	0-9	55-100	50-100	30-95	15-80	<28	NP-9
	28-60	Stratified sand to very gravelly coarse sand.	SP, SP-SM, GP, GP-GM	A-1, A-2, A-3	0	0-9	30-100	25-95	7-65	1-25	---	NP
Soperton	0-6	Silt loam	ML	A-4	2-3	5-15	90-100	85-100	70-100	60-85	<20	NP-4
	6-21	Silt loam, silt.	ML, CL-ML	A-4	1-5	0-15	90-100	85-100	70-100	60-85	<25	NP-6
	21-29	Gravelly sandy loam.	SM, SP-SM	A-4, A-2, A-1	1-5	0-30	70-100	65-90	25-70	10-45	<20	NP-4
	29-37	Gravelly sandy loam, loamy sand.	SM, SC, SC-SM	A-4, A-2, A-1-b	1-5	0-30	70-100	65-90	40-70	20-45	<25	NP-8
	37-61	Gravelly loamy sand, sandy loam, gravelly sandy loam.	SM, SP-SM	A-1, A-2, A-4	1-5	0-30	70-100	65-90	25-70	10-45	<20	NP-4
PgB, PgC:												
Padus	0-2	Silt loam	ML, CL-ML	A-4	0	0-9	95-100	90-100	85-100	80-95	<26	NP-7
	2-3	Silt loam	ML, CL-ML	A-4	0	0-9	95-100	90-100	85-95	80-95	<23	NP-6
	3-12	Silt loam	ML, CL-ML	A-4	0	0-9	95-100	90-100	85-95	80-95	<26	NP-7
	12-28	Sandy loam, loam, fine sandy loam.	SM, SC, ML, CL	A-2, A-4, A-1	0	0-9	55-100	50-100	30-95	15-80	<28	NP-9
	28-60	Stratified sand to very gravelly coarse sand.	SP, SP-SM, GP, GP-GM	A-1, A-2, A-3	0	0-9	30-100	25-95	7-65	1-25	---	NP

Table 16.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 10 inches	Frag-ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO			4	10	40	200		
	In				Pct	Pct					Pct	
PgB, PgC:												
Wabeno--------	0-6	Silt loam-----	ML, CL-ML	A-4	2-3	0-15	90-100	85-100	70-100	60-90	0-25	NP-6
	6-13	Silt loam-----	ML, CL-ML	A-4	2-5	0-15	90-100	85-100	70-100	60-95	0-25	NP-7
	13-27	Silt loam-----	ML, CL, CL-ML	A-4	1-5	0-15	90-100	85-100	70-100	60-90	0-30	NP-10
	27-47	Gravelly sandy loam, loamy sand, sandy loam.	SM, SC, SP-SM, SC-SM	A-1, A-2-4	0-5	0-30	70-100	65-90	30-65	10-35	0-30	NP-10
	47-60	Gravelly sandy loam, cobbly loamy sand, sandy loam.	SM, SC-SM, SP-SM	A-1, A-2-4	0-5	0-30	70-90	65-90	25-70	10-25	0-23	NP-6
PhB----------- Padwood	0-6	Sandy loam----	SM, SC-SM	A-2-4, A-4, A-1-b	0	0-9	80-100	75-100	45-80	20-50	<25	NP-7
	6-20	Sandy loam, loam, fine sandy loam.	SM, SC-SM, ML, CL-ML	A-2-4, A-4, A-1-b	0	0-9	80-100	75-100	45-95	20-80	<25	NP-7
	20-30	Sandy loam, loam, gravelly fine sandy loam.	SM, SC-SM, ML, CL-ML	A-1-b, A-2-4, A-4	0-1	0-9	55-100	50-100	30-95	15-80	<25	NP-7
	30-33	Gravelly loamy sand, sand, loamy sand.	SM, SP, GM, GP	A-1-a, A-2-4, A-3	0-1	0-9	30-100	25-100	7-75	1-35	---	NP
	33-46	Sand, very gravelly coarse sand.	SP, SM, GP, GM	A-1-a, A-2-4, A-3	0-1	0-9	30-98	25-95	7-70	1-25	---	NP
	46-61	Stratified silt loam to sand.	SM, SC-SM, ML, CL-ML	A-2-4, A-4	0	0	95-100	90-100	65-95	20-85	<25	NP-7
PkE----------- Pelissier	0-3	Gravelly sandy loam.	SM, SC-SM, GM, GP-GM	A-1-b, A-2-4	1-2	0-10	60-80	50-75	30-55	10-35	15-25	NP-7
	3-8	Gravelly coarse sandy loam, gravelly loamy sand.	SM, SC-SM, SP-SM, GM	A-3, A-1-b, A-2-4	0-4	0-10	60-80	50-75	20-60	5-35	15-25	NP-7
	8-22	Very gravelly loamy coarse sand, gravelly coarse sand.	SM, SP-SM, GM, GP-GM	A-1-b, A-2-4, A-3	0-4	0-10	40-75	25-75	5-60	5-25	---	NP
	22-61	Very gravelly coarse sand, very gravelly sand, extremely gravelly coarse sand.	SP-SM, GP, GP-GM, SP	A-1-a, A-1-b	0-4	0-10	35-65	25-50	5-50	0-10	---	NP

Table 16.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 10 inches	Frag-ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO			4	10	40	200		
	In				Pct	Pct					Pct	
PnB, PnC, PnD-Pence	0-4	Sandy loam----	SM, ML	A-4, A-2-4, A-1-b	0	0-15	85-100	75-100	45-85	20-55	<21	NP-4
	4-16	Gravelly sandy loam, sandy loam, loam.	SM, ML, CL-ML, SC-SM	A-4, A-2-4, A-1-b	0-4	0-15	55-100	50-100	30-95	15-75	<25	NP-7
	16-22	Gravelly coarse sand, loamy sand, sand.	SM, SP-SM, GM, GP-GM	A-3, A-1-b	0-4	0-15	55-100	50-100	25-75	2-30	---	NP
	22-62	Gravelly sand, sand, very gravelly sand.	SP, SM	A-3, A-1-b	0-4	0-15	55-85	35-90	15-55	2-15	---	NP
PsB, PsC, PsD:												
Pence---------	0-4	Sandy loam----	SM, ML	A-4, A-2-4, A-1-b	0	0-15	85-100	75-100	45-85	20-55	<21	NP-4
	4-16	Gravelly sandy loam, sandy loam, loam.	SM, ML, CL-ML, SC-SM	A-4, A-2-4, A-1-b	0-4	0-15	55-100	50-100	30-95	15-75	<25	NP-7
	16-22	Gravelly coarse sand, loamy sand, sand.	SM, SP-SM, GM, GP-GM	A-3, A-1-b	0-4	0-15	55-100	50-100	25-75	2-30	---	NP
	22-62	Gravelly sand, sand, very gravelly sand.	SP, SM	A-3, A-1-b	0-4	0-15	55-85	35-90	15-55	2-15	---	NP
Vilas---------	0-3	Loamy sand----	SM	A-2-4, A-1-b	0	0	80-100	75-100	30-75	10-35	---	NP
	3-7	Loamy sand, sand.	SM, SP-SM	A-2-4, A-3, A-1-b	0	0	80-100	75-100	20-75	5-35	---	NP
	7-15	Loamy sand----	SM	A-2-4, A-1-b	0	0	80-100	75-100	30-75	10-35	---	NP
	15-29	Sand, loamy sand.	SM, SP-SM	A-2-4, A-3, A-1-b	0	0	80-100	75-100	20-75	5-35	---	NP
	29-60	Sand----------	SM, SP-SM	A-2-4, A-3, A-1-b	0	0	80-100	75-100	20-75	5-25	---	NP
Pt. Pits, gravel												
RuD----------	0-4	Loamy sand----	SM, SP-SM	A-2, A-1	0	0	95-100	75-100	35-75	10-30	---	NP
Rubicon	4-15	Sand----------	SM, SP-SM, SP	A-2, A-3, A-1	0	0	95-100	75-100	35-70	0-15	---	NP
	15-60	Sand, coarse sand.	SP, SP-SM, SM	A-1, A-2, A-3	0	0	95-100	75-100	30-70	0-15	---	NP

Table 16.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 10 inches	Frag-ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO			4	10	40	200		
	In				Pct	Pct					Pct	
SoD:												
Soperton-----	0-6	Silt loam-----	ML	A-4	2-3	5-15	90-100	85-100	70-100	60-85	<20	NP-4
	6-21	Silt loam, silt.	ML, CL-ML	A-4	1-5	0-15	90-100	85-100	70-100	60-85	<25	NP-6
	21-29	Gravelly sandy loam, sandy loam.	SM, SP-SM	A-4, A-2, A-1	1-5	0-30	70-100	65-90	25-70	10-45	<20	NP-4
	29-37	Gravelly sandy loam, loamy sand.	SM, SC, SC-SM	A-4, A-2, A-1-b	1-5	0-30	70-100	65-90	40-70	20-45	<25	NP-8
	37-61	Gravelly loamy sand, sandy loam, gravelly sandy loam.	SM, SP-SM	A-1, A-2, A-4	1-5	0-30	70-100	65-90	25-70	10-45	<20	NP-4
Goodman------	0-3	Silt loam-----	ML, CL-ML	A-4	2-3	0-10	90-100	85-100	85-100	75-100	<23	NP-6
	3-5	Silt loam, silt.	ML	A-4	2-5	0-10	90-100	85-100	85-100	75-100	<21	NP-4
	5-19	Silt loam-----	ML, CL-ML	A-4	2-5	0-10	90-100	85-100	70-100	60-90	<25	NP-7
	19-25	Silt loam, silt.	ML, CL-ML	A-4	2-5	0-10	90-100	85-100	70-100	60-90	<25	NP-7
	25-51	Sandy loam, loamy sand, loam.	ML, CL-ML, SM, SP-SM	A-4, A-1-b, A-2-4	2-10	0-10	65-100	55-95	20-90	8-75	<23	NP-6
	51-61	Loamy sand, fine sandy loam, gravelly sandy loam.	SC-SM, SM, SP-SM	A-4, A-1-b, A-2-4	2-10	0-10	65-100	55-95	20-85	8-50	<23	NP-6
SpD:												
Soperton-----	0-6	Silt loam-----	ML	A-4	2-3	5-15	90-100	85-100	70-100	60-85	<20	NP-4
	6-21	Silt loam, silt.	ML, CL-ML	A-4	1-5	0-15	90-100	85-100	70-100	60-85	<25	NP-6
	21-29	Gravelly sandy loam, sandy loam.	SM, SP-SM	A-4, A-2, A-1	1-5	0-30	70-100	65-90	25-70	10-45	<20	NP-4
	29-37	Gravelly sandy loam, loamy sand.	SM, SC, SC-SM	A-4, A-2, A-1-b	1-5	0-30	70-100	65-90	40-70	20-45	<25	NP-8
	37-61	Gravelly loamy sand, sandy loam, gravelly sandy loam.	SM, SP-SM	A-1, A-2, A-4	1-5	0-30	70-100	65-90	25-70	10-45	<20	NP-4
Mudlake------	0-5	Silt loam-----	ML, CL-ML	A-4	2-3	0-15	80-100	75-100	55-95	50-90	15-25	NP-6
	5-9	Silt loam, silt.	ML, CL-ML	A-4	1-5	0-15	80-100	75-100	55-95	50-90	<25	NP-6
	9-16	Silt loam-----	ML, CL-ML	A-4	0-8	0-15	80-100	75-100	55-95	50-90	15-25	NP-6
	16-29	Silt loam-----	ML, CL-ML	A-4	0-8	0-15	80-100	75-100	55-95	50-90	15-25	NP-7
	29-35	Sandy loam, gravelly sandy loam, loam.	SM, SC, CL, ML	A-2-4, A-4, A-1-b	0-10	0-25	60-95	55-95	35-90	15-75	15-25	NP-9
	35-60	Sandy loam, loamy sand.	SM, SC-SM, SP-SM	A-2-4, A-4, A-1-b	0-10	0-25	60-95	55-95	20-75	8-45	15-25	NP-6

Table 16.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 10 inches	Frag-ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO			4	10	40	200		
	In				Pct	Pct					Pct	
StB, StC, StD-Stambaugh	0-14	Silt loam-----	ML, CL-ML	A-4	0	0-8	95-100	90-100	80-100	55-90	<26	2-7
	14-35	Silt, silt loam, very fine sandy loam.	ML, CL-ML, CL	A-4	0	0-8	95-100	90-100	80-100	80-95	<30	2-9
	35-60	Gravelly sand, very gravelly sand.	SP, SP-SM	A-1	0	0-15	70-90	25-60	15-40	0-10	---	NP
TpA----------Tipler	0-3	Sandy loam----	SM	A-2, A-4	0	0-9	55-100	50-100	30-80	15-50	<20	NP-4
	3-5	Sandy loam, gravelly fine sandy loam, loam.	SM	A-2, A-4	0	0-9	55-100	50-100	30-95	15-80	15-20	NP-4
	5-19	Sandy loam, loam, fine sandy loam.	SM, SC, ML, CL	A-2, A-4, A-1-b	0	0-9	55-100	50-100	30-95	15-80	<26	NP-8
	19-33	Fine sandy loam, sandy loam, loam.	SM, SC, ML, CL	A-2, A-4, A-1	0	0-9	55-100	50-100	30-95	15-80	<30	NP-9
	33-60	Stratified sand to very gravelly coarse sand.	SP, SM, GP, GM	A-1, A-2, A-3	0	0-9	30-100	25-95	7-70	1-25	---	NP
VaB----------Vanzile	0-3	Silt loam-----	ML, CL-ML	A-4	0	0-9	95-100	90-100	85-100	80-95	<25	NP-7
	3-4	Silt loam, silt.	ML, CL-ML	A-4	0	0-9	95-100	90-100	85-100	80-95	<25	NP-7
	4-14	Silt loam-----	ML, CL-ML	A-4	0	0-9	95-100	90-100	85-100	80-95	<25	NP-7
	14-21	Silt loam, silt.	ML, CL-ML	A-4	0	0-9	95-100	90-100	85-100	80-95	<25	NP-7
	21-30	Silt loam-----	ML, CL-ML, CL	A-4	0	0-9	95-100	90-100	85-100	80-95	<30	NP-9
	30-60	Stratified sand to very gravelly coarse sand.	SP, SP-SM, GP, GP-GM	A-1, A-3	0	0-9	45-95	40-95	10-65	2-25	---	NP
VsB, VsC------Vilas	0-3	Loamy sand----	SM	A-2-4, A-1-b	0	0	80-100	75-100	30-75	10-35	---	NP
	3-7	Loamy sand, sand.	SM, SP-SM	A-2-4, A-3, A-1-b	0	0	80-100	75-100	20-75	5-35	---	NP
	7-15	Loamy sand----	SM	A-2-4, A-1-b	0	0	80-100	75-100	30-75	10-35	---	NP
	15-29	Sand, loamy sand.	SM, SP-SM	A-2-4, A-3, A-1-b	0	0	80-100	75-100	20-75	5-35	---	NP
	29-60	Sand----------	SM, SP-SM	A-2-4, A-3, A-1-b	0	0	80-100	75-100	20-75	5-25	---	NP

Table 16.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 10 inches	Frag-ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO			4	10	40	200		
	In				Pct	Pct					Pct	
WaC:												
Wabeno-------	0-6	Silt loam-----	ML, CL-ML	A-4	2-3	0-15	90-100	85-100	70-100	60-90	0-25	NP-6
	6-13	Silt loam-----	ML, CL-ML	A-4	2-5	0-15	90-100	85-100	70-100	60-95	0-25	NP-7
	13-27	Silt loam-----	ML, CL, CL-ML	A-4	1-5	0-15	90-100	85-100	70-100	60-90	0-30	NP-10
	27-47	Gravelly sandy loam, loamy sand, sandy loam.	SM, SC, SP-SM, SC-SM	A-1, A-2-4	0-5	0-30	70-100	65-90	30-65	10-35	0-30	NP-10
	47-60	Gravelly sandy loam, cobbly loamy sand, sandy loam.	SM, SC-SM, SP-SM	A-1, A-2-4	0-5	0-30	70-90	65-90	25-70	10-25	0-23	NP-6
Goodman------	0-3	Silt loam-----	ML, CL-ML	A-4	2-3	0-10	90-100	85-100	85-100	75-100	<23	NP-6
	3-5	Silt loam, silt.	ML	A-4	2-5	0-10	90-100	85-100	85-100	75-100	<21	NP-4
	5-19	Silt loam-----	ML, CL-ML	A-4	2-5	0-10	90-100	85-100	70-100	60-90	<25	NP-7
	19-25	Silt loam, silt.	ML, CL-ML	A-4	2-5	0-10	90-100	85-100	70-100	60-90	<25	NP-7
	25-51	Sandy loam, loamy sand, loam.	ML, CL-ML, SM, SP-SM	A-4, A-1-b, A-2-4	2-10	0-10	65-100	55-95	20-90	8-75	<23	NP-6
	51-61	Loamy sand, fine sandy loam, gravelly sandy loam.	SC-SM, SM, SP-SM	A-4, A-1-b, A-2-4	2-10	0-10	65-100	55-95	20-85	8-50	<23	NP-6
WbB:												
Wabeno-------	0-6	Silt loam-----	ML, CL-ML	A-4	2-3	0-15	90-100	85-100	70-100	60-90	0-25	NP-6
	6-13	Silt loam-----	ML, CL-ML	A-4	2-5	0-15	90-100	85-100	70-100	60-95	0-25	NP-7
	13-27	Silt loam-----	ML, CL, CL-ML	A-4	1-5	0-15	90-100	85-100	70-100	60-90	0-30	NP-10
	27-47	Gravelly sandy loam, loamy sand, sandy loam.	SM, SC, SP-SM, SC-SM	A-1, A-2-4	0-5	0-30	70-100	65-90	30-65	10-35	0-30	NP-10
	47-60	Gravelly sandy loam, cobbly loamy sand, sandy loam.	SM, SC-SM, SP-SM	A-1, A-2-4	0-5	0-30	70-90	65-90	25-70	10-25	0-23	NP-6
Goodwit------	0-3	Silt loam-----	ML, CL-ML	A-4	2-3	0-15	90-100	85-100	70-100	60-90	<23	NP-6
	3-5	Silt loam, silt.	ML	A-4	2-3	0-15	90-100	85-100	70-100	60-100	<21	NP-4
	5-19	Silt loam-----	ML, CL-ML	A-4	2-5	0-15	90-100	85-100	70-100	60-90	<25	NP-7
	19-24	Silt loam-----	ML, CL-ML	A-4	2-5	0-15	90-100	85-100	70-100	60-90	<25	NP-7
	24-45	Loam, sandy loam, gravelly fine sandy loam.	ML, CL, SM, SC	A-4, A-1-b, A-2-4	2-10	0-15	60-100	55-95	35-90	15-75	<28	NP-9
	45-60	Gravelly loamy sand, sandy loam.	SC-SM, SM, SP-SM	A-3, A-1, A-2-4	2-10	0-15	60-100	55-95	20-75	8-45	<23	NP-6

Table 16.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 10 inches	Fragments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO			4	10	40	200		
	In				Pct	Pct					Pct	
WdB:												
Wabeno-------	0-6	Silt loam-----	ML, CL-ML	A-4	2-3	0-15	90-100	85-100	70-100	60-90	0-25	NP-6
	6-13	Silt loam-----	ML, CL-ML	A-4	2-5	0-15	90-100	85-100	70-100	60-95	0-25	NP-7
	13-27	Silt loam-----	ML, CL, CL-ML	A-4	1-5	0-15	90-100	85-100	70-100	60-90	0-30	NP-10
	27-47	Gravelly sandy loam, loamy sand, sandy loam.	SM, SC, SP-SM, SC-SM	A-1, A-2-4	0-5	0-30	70-100	65-90	30-65	10-35	0-30	NP-10
	47-60	Gravelly sandy loam, cobbly loamy sand, sandy loam.	SM, SC-SM, SP-SM	A-1, A-2-4	0-5	0-30	70-90	65-90	25-70	10-25	0-23	NP-6
Mudlake------	0-5	Silt loam-----	ML, CL-ML	A-4	2-3	0-15	80-100	75-100	55-95	50-90	15-25	NP-6
	5-9	Silt loam, silt.	ML, CL-ML	A-4	1-5	0-15	80-100	75-100	55-95	50-90	<25	NP-6
	9-16	Silt loam-----	ML, CL-ML	A-4	0-8	0-15	80-100	75-100	55-95	50-90	15-25	NP-6
	16-29	Silt loam-----	ML, CL-ML	A-4	0-8	0-15	80-100	75-100	55-95	50-90	15-25	NP-7
	29-35	Sandy loam, gravelly sandy loam, loam.	SM, SC, CL, ML	A-2-4, A-4, A-1-b	0-10	0-25	60-95	55-95	35-90	15-75	15-25	NP-9
	35-60	Sandy loam, loamy sand.	SM, SC-SM, SP-SM	A-2-4, A-4, A-1-b	0-10	0-25	60-95	55-95	20-75	8-45	15-25	NP-6
WhA----------	0-3	Silt loam-----	ML, CL-ML	A-4	0	0-8	90-100	85-100	65-100	50-90	<25	NP-7
Whisklake	3-6	Silt loam, silt.	ML, CL-ML	A-4	0	0-8	90-100	85-100	65-100	50-90	<25	NP-7
	6-14	Silt loam, silt.	ML, CL, CL-ML	A-4	0-1	0-8	90-100	85-100	65-100	50-90	18-30	3-10
	14-30	Silt loam, silt.	CL, ML, CL-ML	A-4	0-1	0-8	90-100	85-100	65-100	50-90	18-30	3-10
	30-36	Loam, sandy loam, gravelly fine sandy loam.	ML, CL-ML	A-2, A-4, A-1	0-3	0-8	55-100	50-100	30-95	15-80	<25	NP-7
	36-60	Stratified sand to very gravelly coarse sand.	SP, SP-SM, GP, GP-GM	A-1, A-2, A-3	0-3	0-8	40-100	35-95	10-70	2-25	---	NP
WrA----------	0-2	Sandy loam----	SM, SC, SC-SM	A-4, A-2-4	0	0-9	80-100	75-100	45-90	25-50	<26	NP-8
Worcester	2-19	Sandy loam, loam, gravelly fine sandy loam.	SM, SC, SC-SM	A-4, A-2-4, A-1-b	0	0-9	55-100	50-100	35-95	12-45	<26	NP-8
	19-34	Sandy loam, fine sandy loam, gravelly loam.	SM, SC, SC-SM	A-4, A-2-4, A-1-b	0	0-9	55-100	50-100	35-95	12-45	18-28	3-9
	34-39	Loamy sand, very gravelly coarse sand, sand.	SM, GM	A-2-4, A-3, A-1-a	0	0-9	30-100	25-100	10-75	5-35	<18	NP-3
	39-60	Stratified sand to very gravelly coarse sand.	SP, SM, GP, GM	A-3, A-1-a	0	0-9	30-100	25-100	7-70	1-25	---	NP

Table 16.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 10 inches	Frag-ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO			4	10	40	200		
	In				Pct	Pct					Pct	
WtA---------- Wormet	0-5	Sandy loam----	SM, SC	A-4, A-2-4	0	0-15	80-100	75-100	45-90	25-50	<26	NP-8
	5-18	Sandy loam, gravelly fine sandy loam, loam.	SM, SC	A-4, A-2-4, A-1-b	0	0-15	55-100	50-100	35-95	12-45	<26	NP-8
	18-61	Stratified sand to very gravelly coarse sand.	SP, SM, GP, GM	A-3, A-1-a	0	0-15	45-100	40-95	9-70	1-25	---	NP

Table 17.--Physical and Chemical Properties of the Soils

(See text for definitions of terms used in this table. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated)

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability (Ksat)	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors			Wind erodibility group	Organic matter
								K	Kf	T		
	In	Pct	g/cc	In/hr	In/in	pH						Pct
ArB:												
Argonne---------	0-5	3-10	1.35-1.60	0.6-2.0	0.14-0.18	3.6-6.5	Low----------	0.24	0.24	4	3	.5-2
	5-15	4-12	1.45-1.75	0.6-2.0	0.11-0.19	3.6-6.5	Low----------	0.28	0.28			
	15-29	4-12	1.55-1.75	0.6-2.0	0.13-0.17	3.6-6.5	Low----------	0.28	0.28			
	29-39	6-16	1.60-1.80	0.06-0.2	0.08-0.12	3.6-6.5	Low----------	0.28	0.28			
	39-54	4-14	1.80-1.95	0.06-0.2	0.0-0.04	3.6-6.5	Low----------	0.10	0.17			
	54-82	3-10	1.80-1.95	0.6-6.0	0.0-0.04	5.1-6.5	Low----------	0.10	0.17			
Sarwet----------	0-1	4-15	1.35-1.65	0.6-2.0	0.08-0.18	4.5-7.3	Low----------	0.24	0.24	5	3	2-3
	1-3	4-15	1.55-1.65	0.6-2.0	0.08-0.19	3.6-6.0	Low----------	0.24	0.24			
	3-18	4-15	1.55-1.65	0.6-2.0	0.08-0.19	4.5-6.0	Low----------	0.24	0.24			
	18-27	4-15	1.60-1.80	0.6-2.0	0.06-0.17	5.1-6.0	Low----------	0.24	0.24			
	27-48	5-17	1.60-1.80	0.6-2.0	0.08-0.17	5.1-6.5	Low----------	0.24	0.24			
	48-60	4-15	1.60-1.80	0.6-2.0	0.05-0.13	5.1-6.5	Low----------	0.28	0.28			
Au----------	0-4	10-15	1.30-1.55	6.0-20	0.07-0.09	3.6-7.3	Low----------	0.10	0.10	5	2	2-4
Au Gres	4-29	1-15	1.50-1.70	6.0-20	0.06-0.09	3.6-7.3	Low----------	0.10	0.15			
	29-60	0-8	1.50-1.70	6.0-20	0.05-0.07	4.5-7.3	Low----------	0.10	0.15			
Ca----------	0-5	---	0.15-0.35	2.0-6.0	0.35-0.45	4.5-7.3	Low----------	0.37	0.37	5	2	50-80
Capitola	5-22	8-17	1.35-1.60	0.2-2.0	0.09-0.22	4.5-7.3	Low----------	0.43	0.43			
	22-36	8-16	1.40-1.90	0.2-2.0	0.07-0.16	4.5-7.3	Low----------	0.28	0.28			
	36-60	5-10	1.70-1.90	0.2-0.6	0.05-0.16	5.1-7.8	Low----------	0.28	0.28			
CrA----------	0-3	5-15	1.30-1.50	6.0-20	0.09-0.12	3.6-6.5	Low----------	0.10	0.10	5	2	.5-2
Croswell	3-28	0-10	1.40-1.60	6.0-20	0.06-0.10	3.6-7.3	Low----------	0.10	0.15			
	28-60	0-10	1.50-1.65	6.0-20	0.05-0.07	3.6-8.4	Low----------	0.10	0.15			
CuA----------	0-4	1-10	1.35-1.60	2.0-6.0	0.08-0.12	3.6-6.0	Low----------	0.10	0.10	5	2	1-2
Cublake	4-5	0-10	1.35-1.65	2.0-20	0.05-0.12	3.6-6.0	Low----------	0.17	0.17			
	5-21	0-10	1.40-1.70	2.0-20	0.04-0.11	3.6-6.0	Low----------	0.17	0.17			
	21-49	0-5	1.45-1.70	2.0-20	0.04-0.11	3.6-7.3	Low----------	0.15	0.15			
	49-60	10-25	1.40-1.80	0.2-2.0	0.12-0.18	5.1-7.3	Low----------	0.32	0.32			
FeB----------	0-2	8-20	1.35-1.55	0.6-2.0	0.20-0.24	3.6-7.3	Low----------	0.37	0.37	5	5	1-2
Fence	2-3	5-15	1.35-1.55	0.6-2.0	0.20-0.22	3.6-6.5	Low----------	0.37	0.37			
	3-9	5-15	1.50-1.65	0.6-2.0	0.16-0.22	3.6-6.0	Low----------	0.37	0.37			
	9-17	5-15	1.50-1.65	0.6-2.0	0.16-0.22	3.6-6.5	Low----------	0.43	0.43			
	17-42	8-18	1.50-1.65	0.6-2.0	0.16-0.22	3.6-6.5	Low----------	0.43	0.43			
	42-60	5-15	1.50-1.65	0.2-0.6	0.14-0.20	4.5-7.8	Low----------	0.43	0.43			
FlA----------	0-3	3-6	1.35-1.60	2.0-6.0	0.08-0.12	3.6-6.0	Low----------	0.10	0.10	5	2	1-3
Flink	3-29	1-6	1.35-1.65	2.0-20	0.05-0.10	3.6-6.0	Low----------	0.15	0.15			
	29-44	1-3	1.40-1.70	2.0-20	0.05-0.08	5.1-7.3	Low----------	0.15	0.15			
	44-61	10-35	1.40-1.80	0.2-2.0	0.13-0.19	5.1-7.3	Low----------	0.32	0.32			
Fm----------	0-6	10-23	1.35-1.45	0.6-2.0	0.17-0.24	4.5-8.4	Low----------	0.24	0.24	4	8	4-12
Fordum	6-26	8-17	1.40-1.50	0.6-6.0	0.10-0.22	4.5-8.4	Low----------	0.37	0.37			
	26-60	2-5	1.55-1.70	>6.0	0.04-0.10	5.6-8.4	Low----------	0.15	0.15			
GaA----------	0-3	5-15	1.30-1.55	0.6-2.0	0.22-0.24	3.6-7.3	Low----------	0.37	0.37	5	5	2-4
Gastrow	3-5	2-15	1.30-1.55	0.6-2.0	0.18-0.22	3.6-7.3	Low----------	0.43	0.43			
	5-13	5-15	1.40-1.65	0.6-2.0	0.18-0.22	3.6-6.0	Low----------	0.43	0.43			
	13-29	5-15	1.40-1.65	0.6-2.0	0.18-0.22	3.6-6.0	Low----------	0.43	0.43			
	29-40	8-17	1.40-1.65	0.6-2.0	0.16-0.20	5.1-7.3	Low----------	0.24	0.24			
	40-60	5-15	1.45-1.65	0.6-2.0	0.12-0.16	5.6-7.3	Low----------	0.24	0.24			

Table 17.--Physical and Chemical Properties of the Soils--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability (Ksat)	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors			Wind erodibility group	Organic matter
								K	Kf	T		
	In	Pct	g/cc	In/hr	In/in	pH						Pct
Kr	0-6	---	0.10-0.35	2.0-20	0.35-0.45	3.6-5.0		0.05	0.05	5	2	20-70
Kinross	6-39	0-10	1.40-1.70	6.0-20	0.04-0.09	3.6-6.0	Low	0.15	0.15			
	39-60	0-10	1.40-1.70	6.0-20	0.04-0.06	4.5-6.5	Low	0.15	0.15			
LaC, LaD:												
Laona	0-3	3-10	1.35-1.60	0.6-2.0	0.14-0.18	3.6-6.5	Low	0.24	0.24	4	3	2-3
	3-7	3-10	1.45-1.75	0.6-2.0	0.13-0.17	3.6-6.5	Low	0.24	0.24			
	7-21	4-12	1.55-1.75	0.6-2.0	0.11-0.19	3.6-6.5	Low	0.28	0.28			
	21-35	4-16	1.60-1.80	0.06-0.2	0.08-0.12	3.6-6.5	Low	0.28	0.28			
	35-70	6-16	1.80-1.95	0.06-0.2	0.0-0.04	3.6-6.5	Low	0.20	0.28			
	70-80	3-10	1.80-1.95	0.6-6.0	0.0-0.04	5.1-6.5	Low	0.10	0.17			
Sarona	0-3	4-12	1.35-1.65	0.6-2.0	0.10-0.18	4.5-7.3	Low	0.24	0.24	5	3	1-3
	3-22	4-12	1.55-1.65	0.6-6.0	0.05-0.17	4.5-6.0	Low	0.24	0.24			
	22-47	4-15	1.55-1.70	0.6-6.0	0.05-0.17	4.5-6.0	Low	0.24	0.24			
	47-56	5-17	1.60-1.70	0.6-6.0	0.07-0.17	5.1-6.5	Low	0.17	0.24			
	56-60	4-15	1.60-1.70	0.6-6.0	0.05-0.15	5.1-6.5	Low	0.17	0.17			
Lo:												
Loxley	0-12	---	0.30-0.40	>6.0	0.55-0.65	3.6-4.4		-----	-----	3	7	70-90
	12-60	---	0.10-0.35	0.2-6.0	0.35-0.45	3.6-4.4		-----	-----			
Beseman	0-12	---	0.10-0.20	>6.0	0.55-0.65	3.6-4.4		-----	-----	2	7	25-75
	12-36	---	0.10-0.25	0.6-6.0	0.35-0.45	3.6-4.4		-----	-----			
	36-60	10-27	1.55-1.95	0.2-0.6	0.11-0.18	3.6-7.3	Moderate	0.28	0.37			
Dawson	0-10	---	0.15-0.30	>6.0	0.55-0.65	3.6-4.4		-----	-----	2	7	65-85
	10-44	---	0.15-0.40	0.2-6.0	0.35-0.45	3.6-4.4		-----	-----			
	44-60	0-10	1.55-1.75	6.0-20	0.03-0.10	4.5-6.5	Low	0.10	0.15			
Lu:												
Lupton	0-10	---	0.10-0.35	0.2-6.0	0.35-0.45	5.6-7.8		-----	-----	3	2	70-90
	10-60	---	0.10-0.35	0.2-6.0	0.35-0.45	5.6-7.8		-----	-----			
Cathro	0-8	---	0.28-0.45	0.2-6.0	0.35-0.45	4.5-7.8		-----	-----	2	2	60-85
	8-30	---	0.15-0.30	0.2-6.0	0.35-0.45	4.5-7.8		-----	0.32			
	30-60	10-30	1.50-1.70	0.2-2.0	0.11-0.22	5.6-8.4	Low	0.32	-----			
Markey	0-36	---	0.15-0.45	0.2-6.0	0.35-0.45	5.6-7.8		-----	-----	2	2	55-85
	36-60	0-10	1.40-1.65	>20	0.03-0.08	5.6-8.4	Low	0.10	0.15			
MaA	0-2	4-10	1.30-1.70	2.0-6.0	0.11-0.15	4.5-7.3	Low	0.20	0.20	3	3	1-3
Manitowish	2-4	5-15	1.35-1.65	0.6-6.0	0.11-0.18	4.5-7.3	Low	0.24	0.24			
	4-16	5-15	1.40-1.70	0.6-6.0	0.11-0.18	4.5-6.0	Low	0.24	0.24			
	16-22	3-12	1.45-1.65	2.0-60	0.04-0.12	4.5-6.5	Low	0.15	0.15			
	22-60	0-3	1.55-1.70	6.0-60	0.02-0.07	5.1-6.5	Low	0.10	0.15			
MeD:												
Metonga	0-3	7-15	1.35-1.60	0.6-2.0	0.18-0.24	3.6-6.0	Low	0.37	0.37	2	3	1-4
	3-4	3-15	1.35-1.70	0.6-2.0	0.16-0.22	3.6-6.0	Low	0.37	0.37			
	4-25	3-15	1.40-1.70	0.6-2.0	0.13-0.24	3.6-6.0	Low	0.37	0.37			
	25-28	3-10	1.40-1.75	0.6-2.0	0.05-0.16	5.1-6.5	Low	0.24	0.24			
	28	---	---	0.01-20	---	---		-----	-----			
Rock outcrop.												
Mn	0-4	---	0.15-0.45	2.0-6.0	0.35-0.45	4.5-7.8	Low	0.32	0.32	4	2	30-60
Minocqua	4-28	10-17	1.50-1.60	0.6-2.0	0.11-0.19	4.5-7.8	Low	0.43	0.43			
	28-60	0-3	1.75-1.85	>6.0	0.02-0.04	4.5-7.8	Low	0.10	0.10			

Table 17.--Physical and Chemical Properties of the Soils--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability (Ksat)	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors			Wind erodibility group	Organic matter
								K	Kf	T		
	In	Pct	g/cc	In/hr	In/in	pH						Pct
MuB	0-5	4-15	1.35-1.60	0.6-2.0	0.18-0.24	4.5-7.3	Low	0.43	0.43	5	5	2-4
Mudlake	5-9	4-12	1.45-1.60	0.6-2.0	0.17-0.22	4.5-6.0	Low	0.37	0.37			
	9-16	4-15	1.45-1.60	0.6-2.0	0.17-0.22	4.5-6.0	Low	0.37	0.37			
	16-29	4-17	1.45-1.60	0.6-2.0	0.17-0.22	4.5-6.0	Low	0.37	0.37			
	29-35	5-17	1.40-1.70	0.6-2.0	0.07-0.21	4.5-6.0	Low	0.28	0.28			
	35-60	4-12	1.40-1.70	0.6-6.0	0.05-0.14	5.1-6.5	Low	0.20	0.20			
PaB, PaC, PaD	0-2	3-10	1.35-1.70	0.6-2.0	0.10-0.18	4.5-7.3	Low	0.24	0.24	4	3	1-3
Padus	2-4	3-12	1.40-1.70	0.6-2.0	0.09-0.19	4.5-6.5	Low	0.24	0.24			
	4-16	6-15	1.40-1.70	0.6-2.0	0.09-0.19	4.5-6.0	Low	0.24	0.24			
	16-25	6-18	1.40-1.70	0.6-2.0	0.06-0.19	4.5-6.5	Low	0.24	0.24			
	25-60	0-3	1.55-1.80	>6.0	0.01-0.06	5.1-6.5	Low	0.10	0.10			
PeB, PeC, PeD:												
Padus	0-2	3-10	1.35-1.70	0.6-2.0	0.10-0.18	4.5-7.3	Low	0.24	0.24	4	3	1-3
	2-4	3-12	1.40-1.70	0.6-2.0	0.09-0.19	4.5-6.5	Low	0.24	0.24			
	4-16	6-15	1.40-1.70	0.6-2.0	0.09-0.19	4.5-6.0	Low	0.24	0.24			
	16-25	6-18	1.40-1.70	0.6-2.0	0.06-0.19	4.5-6.5	Low	0.24	0.24			
	25-60	0-3	1.55-1.80	>6.0	0.01-0.06	5.1-6.5	Low	0.10	0.10			
Pence	0-4	3-15	1.20-1.65	2.0-6.0	0.10-0.18	4.5-7.3	Low	0.20	0.20	3	3	1-3
	4-16	2-15	1.35-1.45	0.6-6.0	0.10-0.15	4.5-6.0	Low	0.17	0.24			
	16-22	2-10	1.65-1.75	2.0-60	0.05-0.08	4.5-6.5	Low	0.05	0.10			
	22-62	0-4	1.35-1.80	6.0-60	0.02-0.05	5.1-6.5	Low	0.05	0.10			
PfD:												
Padus	0-2	6-15	1.35-1.55	0.6-2.0	0.16-0.24	4.5-7.3	Low	0.43	0.43	4	5	2-4
	2-3	3-12	1.35-1.55	0.6-2.0	0.16-0.24	4.5-6.5	Low	0.37	0.24			
	3-12	6-15	1.35-1.55	0.6-2.0	0.16-0.24	4.5-6.0	Low	0.37	0.24			
	12-28	6-18	1.40-1.70	0.6-2.0	0.06-0.19	4.5-6.5	Low	0.24	0.24			
	28-60	0-3	1.55-1.80	>6.0	0.01-0.06	5.1-6.5	Low	0.10	0.10			
Soperton	0-6	3-10	1.20-1.50	0.6-2.0	0.16-0.23	3.6-7.3	Low	0.43	0.43	4	5	2-3
	6-21	4-12	1.30-1.45	0.6-2.0	0.16-0.21	3.6-6.0	Low	0.43	0.43			
	21-29	6-16	1.65-1.80	0.6-2.0	0.06-0.17	3.6-6.5	Low	0.20	0.28			
	29-37	6-16	1.80-1.95	0.06-0.2	0.01-0.03	3.6-6.5	Low	0.20	0.24			
	37-61	3-10	1.65-1.80	0.6-6.0	0.01-0.03	4.5-6.5	Low	0.10	0.17			
PgB, PgC:												
Padus	0-2	6-15	1.35-1.55	0.6-2.0	0.16-0.24	4.5-7.3	Low	0.43	0.43	4	5	2-4
	2-3	3-12	1.35-1.55	0.6-2.0	0.16-0.24	4.5-6.5	Low	0.37	0.24			
	3-12	6-15	1.35-1.55	0.6-2.0	0.16-0.24	4.5-6.0	Low	0.37	0.24			
	12-28	6-18	1.40-1.70	0.6-2.0	0.06-0.19	4.5-6.5	Low	0.24	0.24			
	28-60	0-3	1.55-1.80	>6.0	0.01-0.06	5.1-6.5	Low	0.10	0.10			
Wabeno	0-6	3-10	1.20-1.50	0.6-2.0	0.14-0.23	3.6-7.3	Low	0.43	0.43	4	5	1-3
	6-13	3-10	1.30-1.45	0.6-2.0	0.17-0.24	3.6-6.0	Low	0.37	0.37			
	13-27	6-16	1.65-1.80	0.6-2.0	0.12-0.22	5.1-6.5	Low	0.43	0.43			
	27-47	6-16	1.80-1.95	0.06-0.2	0.01-0.03	5.1-6.5	Low	0.17	0.24			
	47-60	3-10	1.65-1.80	0.6-2.0	0.01-0.03	4.5-6.5	Low	0.20	0.28			
PhB	0-6	3-15	1.35-1.70	0.6-2.0	0.10-0.18	4.5-7.3	Low	0.24	0.24	4	3	2-3
Padwood	6-20	3-15	1.40-1.70	0.6-2.0	0.09-0.19	4.5-6.0	Low	0.24	0.24			
	20-30	3-15	1.40-1.70	0.6-2.0	0.06-0.19	4.5-6.5	Low	0.24	0.24			
	30-33	2-5	1.40-1.70	>6.0	0.02-0.11	4.5-6.5	Low	0.10	0.17			
	33-46	0-3	1.50-1.80	>6.0	0.01-0.08	5.1-6.5	Low	0.10	0.10			
	46-61	5-15	1.40-1.80	0.2-0.6	0.10-0.18	5.1-6.5	Low	0.32	0.32			
PkE	0-3	2-15	1.30-1.60	2.0-6.0	0.10-0.12	4.5-5.5	Low	0.20	0.24	3	3	.5-1
Pelissier	3-8	2-15	1.30-1.65	2.0-6.0	0.08-0.12	5.1-5.5	Low	0.10	0.17			
	8-22	0-10	1.30-1.70	>20	0.03-0.05	5.1-5.5	Low	0.10	0.15			
	22-61	0-5	1.55-1.65	>20	0.02-0.04	5.1-5.5	Low	0.10	0.10			

Table 17.--Physical and Chemical Properties of the Soils--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability (Ksat)	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors			Wind erodibility group	Organic matter
								K	Kf	T		
	In	Pct	g/cc	In/hr	In/in	pH						Pct
PnB, PnC, PnD----	0-4	3-15	1.20-1.65	2.0-6.0	0.10-0.18	4.5-7.3	Low----------	0.20	0.20	3	3	1-3
Pence	4-16	2-15	1.35-1.45	0.6-6.0	0.10-0.15	4.5-6.0	Low----------	0.17	0.24			
	16-22	2-10	1.65-1.75	2.0-60	0.05-0.08	4.5-6.5	Low----------	0.05	0.10			
	22-62	0-4	1.35-1.80	6.0-60	0.02-0.05	5.1-6.5	Low----------	0.05	0.10			
PsB, PsC, PsD:												
Pence----------	0-4	3-15	1.20-1.65	2.0-6.0	0.10-0.18	4.5-7.3	Low----------	0.20	0.20	3	3	1-3
	4-16	2-15	1.35-1.45	0.6-6.0	0.10-0.15	4.5-6.0	Low----------	0.17	0.24			
	16-22	2-10	1.65-1.75	2.0-60	0.05-0.08	4.5-6.5	Low----------	0.05	0.10			
	22-62	0-4	1.35-1.80	6.0-60	0.02-0.05	5.1-6.5	Low----------	0.05	0.10			
Vilas----------	0-3	2-6	1.35-1.65	6.0-20	0.09-0.12	4.5-7.3	Low----------	0.10	0.10	5	2	1-3
	3-7	1-5	1.35-1.65	6.0-20	0.06-0.12	4.5-6.5	Low----------	0.17	0.17			
	7-15	2-6	1.50-1.65	6.0-20	0.07-0.12	4.5-6.5	Low----------	0.17	0.17			
	15-29	1-5	1.50-1.70	6.0-20	0.05-0.08	4.5-6.5	Low----------	0.15	0.15			
	29-60	0-3	1.50-1.70	6.0-20	0.04-0.07	4.5-6.5	Low----------	0.15	0.15			
Pt.												
Pits, gravel												
RuD----------	0-4	0-10	1.25-1.45	6.0-20	0.10-0.12	4.5-6.0	Low----------	0.10	0.10	5	2	.5-2
Rubicon	4-15	0-10	1.30-1.60	6.0-20	0.04-0.08	4.5-6.0	Low----------	0.10	0.15			
	15-60	0-5	1.40-1.65	6.0-20	0.04-0.06	4.5-6.5	Low----------	0.10	0.15			
SoD:												
Soperton--------	0-6	3-10	1.20-1.50	0.6-2.0	0.16-0.23	3.6-7.3	Low----------	0.43	0.43	4	5	2-3
	6-21	4-12	1.30-1.45	0.6-2.0	0.16-0.21	3.6-6.0	Low----------	0.43	0.43			
	21-29	6-16	1.65-1.80	0.6-2.0	0.06-0.17	3.6-6.5	Low----------	0.20	0.28			
	29-37	6-16	1.80-1.95	0.06-0.2	0.01-0.03	3.6-6.5	Low----------	0.20	0.24			
	37-61	3-10	1.65-1.80	0.6-6.0	0.01-0.03	4.5-6.5	Low----------	0.10	0.17			
Goodman---------	0-3	5-12	1.35-1.45	0.6-2.0	0.19-0.24	3.6-6.5	Low----------	0.43	0.43	5	5	2-4
	3-5	4-10	1.45-1.60	0.6-2.0	0.18-0.24	3.6-6.5	Low----------	0.37	0.37			
	5-19	8-14	1.45-1.60	0.6-2.0	0.17-0.22	3.6-6.5	Low----------	0.37	0.37			
	19-25	8-14	1.50-1.60	0.6-2.0	0.17-0.22	3.6-6.5	Low----------	0.43	0.43			
	25-51	2-12	1.50-1.70	0.6-2.0	0.05-0.18	3.6-6.5	Low----------	0.24	0.24			
	51-61	2-12	1.50-1.75	0.6-6.0	0.05-0.16	5.1-6.5	Low----------	0.28	0.28			
SpD:												
Soperton--------	0-6	3-10	1.20-1.50	0.6-2.0	0.16-0.23	3.6-7.3	Low----------	0.43	0.43	4	5	2-3
	6-21	4-12	1.30-1.45	0.6-2.0	0.16-0.21	3.6-6.0	Low----------	0.43	0.43			
	21-29	6-16	1.65-1.80	0.6-2.0	0.06-0.17	3.6-6.5	Low----------	0.20	0.28			
	29-37	6-16	1.80-1.95	0.06-0.2	0.01-0.03	3.6-6.5	Low----------	0.20	0.24			
	37-61	3-10	1.65-1.80	0.6-6.0	0.01-0.03	4.5-6.5	Low----------	0.10	0.17			
Mudlake---------	0-5	4-15	1.35-1.60	0.6-2.0	0.18-0.24	4.5-7.3	Low----------	0.43	0.43	5	5	2-4
	5-9	4-12	1.45-1.60	0.6-2.0	0.17-0.22	4.5-6.0	Low----------	0.37	0.37			
	9-16	4-15	1.45-1.60	0.6-2.0	0.17-0.22	4.5-6.0	Low----------	0.37	0.37			
	16-29	4-17	1.45-1.60	0.6-2.0	0.17-0.22	4.5-6.0	Low----------	0.37	0.37			
	29-35	5-17	1.40-1.70	0.6-2.0	0.07-0.21	4.5-6.0	Low----------	0.28	0.28			
	35-60	4-12	1.40-1.70	0.6-6.0	0.05-0.14	5.1-6.5	Low----------	0.20	0.20			
StB, StC, StD----	0-14	5-15	1.10-1.60	0.6-2.0	0.21-0.24	4.5-6.0	Low----------	0.43	0.43	4	5	1-3
Stambaugh	14-35	8-18	1.25-1.70	0.2-0.6	0.20-0.22	4.5-6.0	Low----------	0.37	0.32			
	35-60	0-8	1.50-1.70	>20	0.02-0.04	5.1-6.5	Low----------	0.10	-----			
TpA----------	0-3	3-10	1.35-1.70	0.6-2.0	0.10-0.15	4.5-7.3	Low----------	0.24	0.24	4	3	2-3
Tipler	3-5	3-10	1.40-1.65	0.6-2.0	0.08-0.19	4.5-6.5	Low----------	0.24	0.24			
	5-19	5-15	1.40-1.65	0.6-2.0	0.09-0.19	4.5-6.0	Low----------	0.24	0.24			
	19-33	6-17	1.40-1.65	0.6-2.0	0.06-0.19	5.1-6.5	Low----------	0.24	0.24			
	33-60	0-3	1.55-1.80	>6.0	0.01-0.06	5.1-6.5	Low----------	0.15	0.10			

Table 17.--Physical and Chemical Properties of the Soils--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability (Ksat)	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors			Wind erodibility group	Organic matter
								K	Kf	T		
	In	Pct	g/cc	In/hr	In/in	pH						Pct
VaB----------	0-3	5-15	1.35-1.55	0.6-2.0	0.20-0.24	4.5-7.3	Low----------	0.43	0.43	4	5	1-3
Vanzile	3-4	3-15	1.35-1.55	0.6-2.0	0.20-0.24	4.5-6.0	Low----------	0.37	0.37			
	4-14	5-15	1.35-1.65	0.6-2.0	0.17-0.22	4.5-6.0	Low----------	0.37	0.37			
	14-21	3-15	1.35-1.65	0.6-2.0	0.17-0.22	4.5-6.5	Low----------	0.43	0.43			
	21-30	8-18	1.40-1.65	0.2-2.0	0.17-0.22	4.5-6.5	Low----------	0.43	0.43			
	30-60	0-8	1.50-1.80	>6.0	0.01-0.06	4.5-6.5	Low----------	0.10	0.15			
VsB, VsC----------	0-3	2-6	1.35-1.65	6.0-20	0.09-0.12	4.5-7.3	Low----------	0.10	0.10	5	2	1-3
Vilas	3-7	1-5	1.35-1.65	6.0-20	0.06-0.12	4.5-6.5	Low----------	0.17	0.17			
	7-15	2-6	1.50-1.65	6.0-20	0.07-0.12	4.5-6.5	Low----------	0.17	0.17			
	15-29	1-5	1.50-1.70	6.0-20	0.05-0.08	4.5-6.5	Low----------	0.15	0.15			
	29-60	0-3	1.50-1.70	6.0-20	0.04-0.07	4.5-6.5	Low----------	0.15	0.15			
WaC:												
Wabeno----------	0-6	3-10	1.20-1.50	0.6-2.0	0.14-0.23	3.6-7.3	Low----------	0.43	0.43	4	5	1-3
	6-13	3-10	1.30-1.45	0.6-2.0	0.17-0.24	3.6-6.0	Low----------	0.37	0.37			
	13-27	6-16	1.65-1.80	0.6-2.0	0.12-0.22	5.1-6.5	Low----------	0.43	0.43			
	27-47	6-16	1.80-1.95	0.06-0.2	0.01-0.03	5.1-6.5	Low----------	0.17	0.24			
	47-60	3-10	1.65-1.80	0.6-2.0	0.01-0.03	4.5-6.5	Low----------	0.20	0.28			
Goodman---------	0-3	5-12	1.35-1.45	0.6-2.0	0.19-0.24	3.6-6.5	Low----------	0.43	0.43	5	5	2-4
	3-5	4-10	1.45-1.60	0.6-2.0	0.18-0.24	3.6-6.5	Low----------	0.37	0.37			
	5-19	8-14	1.45-1.60	0.6-2.0	0.17-0.22	3.6-6.5	Low----------	0.37	0.37			
	19-25	8-14	1.50-1.60	0.6-2.0	0.17-0.22	3.6-6.5	Low----------	0.43	0.43			
	25-51	2-12	1.50-1.70	0.6-2.0	0.05-0.18	3.6-6.5	Low----------	0.24	0.24			
	51-61	2-12	1.50-1.75	0.6-6.0	0.05-0.16	5.1-6.5	Low----------	0.28	0.28			
WbB:												
Wabeno----------	0-6	3-10	1.20-1.50	0.6-2.0	0.14-0.23	3.6-7.3	Low----------	0.43	0.43	4	5	1-3
	6-13	3-10	1.30-1.45	0.6-2.0	0.17-0.24	3.6-6.0	Low----------	0.37	0.37			
	13-27	6-16	1.65-1.80	0.6-2.0	0.12-0.22	5.1-6.5	Low----------	0.43	0.43			
	27-47	6-16	1.80-1.95	0.06-0.2	0.01-0.03	5.1-6.5	Low----------	0.17	0.24			
	47-60	3-10	1.65-1.80	0.6-2.0	0.01-0.03	4.5-6.5	Low----------	0.20	0.28			
Goodwit---------	0-3	5-12	1.35-1.45	0.6-2.0	0.19-0.24	4.5-7.3	Low----------	0.43	0.43	5	5	2-4
	3-5	4-10	1.45-1.60	0.6-2.0	0.18-0.22	4.5-7.3	Low----------	0.37	0.37			
	5-19	6-14	1.45-1.60	0.6-2.0	0.17-0.22	4.5-6.0	Low----------	0.37	0.37			
	19-24	8-14	1.50-1.60	0.6-2.0	0.17-0.22	4.5-6.5	Low----------	0.43	0.43			
	24-45	8-17	1.50-1.70	0.6-2.0	0.07-0.18	4.5-6.5	Low----------	0.32	0.32			
	45-60	2-12	1.50-1.75	0.6-2.0	0.05-0.12	5.1-6.5	Low----------	0.10	0.17			
WdB:												
Wabeno----------	0-6	3-10	1.20-1.50	0.6-2.0	0.14-0.23	3.6-7.3	Low----------	0.43	0.43	4	5	1-3
	6-13	3-10	1.30-1.45	0.6-2.0	0.17-0.24	3.6-6.0	Low----------	0.37	0.37			
	13-27	6-16	1.65-1.80	0.6-2.0	0.12-0.22	5.1-6.5	Low----------	0.43	0.43			
	27-47	6-16	1.80-1.95	0.06-0.2	0.01-0.03	5.1-6.5	Low----------	0.17	0.24			
	47-60	3-10	1.65-1.80	0.6-2.0	0.01-0.03	4.5-6.5	Low----------	0.20	0.28			
Mudlake---------	0-5	4-15	1.35-1.60	0.6-2.0	0.18-0.24	4.5-7.3	Low----------	0.43	0.43	5	5	2-4
	5-9	4-12	1.45-1.60	0.6-2.0	0.17-0.22	4.5-6.0	Low----------	0.37	0.37			
	9-16	4-15	1.45-1.60	0.6-2.0	0.17-0.22	4.5-6.0	Low----------	0.37	0.37			
	16-29	4-17	1.45-1.60	0.6-2.0	0.17-0.22	4.5-6.0	Low----------	0.37	0.37			
	29-35	5-17	1.40-1.70	0.6-2.0	0.07-0.21	4.5-6.0	Low----------	0.28	0.28			
	35-60	4-12	1.40-1.70	0.6-6.0	0.05-0.14	5.1-6.5	Low----------	0.20	0.20			
WhA----------	0-3	6-15	1.35-1.55	0.6-2.0	0.16-0.24	4.5-7.3	Low----------	0.43	0.43	4	5	1-3
Whisklake	3-6	6-15	1.35-1.55	0.6-2.0	0.15-0.22	4.5-6.0	Low----------	0.37	0.37			
	6-14	8-18	1.35-1.55	0.6-2.0	0.15-0.22	4.5-6.0	Low----------	0.37	0.37			
	14-30	8-18	1.40-1.60	0.6-2.0	0.15-0.22	4.5-6.0	Low----------	0.43	0.43			
	30-36	6-15	1.40-1.70	0.6-2.0	0.08-0.19	5.1-6.5	Low----------	0.32	0.32			
	36-60	0-3	1.30-2.00	>6.0	0.02-0.07	5.1-6.5	Low----------	0.15	0.15			

Table 17.--Physical and Chemical Properties of the Soils--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability (Ksat)	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors			Wind erodibility group	Organic matter
								K	Kf	T		
	In	Pct	g/cc	In/hr	In/in	pH						Pct
WrA----------	0-2	5-15	1.35-1.70	0.6-2.0	0.10-0.18	4.5-7.3	Low----------	0.24	0.24	4	3	1-3
Worcester	2-19	5-15	1.40-1.70	0.6-2.0	0.06-0.19	4.5-6.0	Low----------	0.24	0.24			
	19-34	8-17	1.40-1.70	0.6-2.0	0.06-0.19	4.5-6.5	Low----------	0.24	0.24			
	34-39	3-8	1.45-1.70	>6.0	0.02-0.11	4.5-6.5	Low----------	0.10	0.17			
	39-60	0-3	1.50-1.80	>6.0	0.01-0.07	5.1-6.5	Low----------	0.10	0.15			
WtA----------	0-5	5-15	1.35-1.70	0.6-2.0	0.10-0.19	4.5-6.0	Low----------	0.24	0.24	3	3	1-3
Wormet	5-18	5-15	1.40-1.70	0.6-6.0	0.06-0.18	4.5-6.0	Low----------	0.24	0.24			
	18-61	0-3	1.50-1.80	6.0-60	0.01-0.07	5.1-6.5	Low----------	0.10	0.15			

Table 18.--Soil and Water Features

(See text for definitions of terms used in this table. Absence of an entry indicates that the feature is not a concern or that data were not estimated)

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Total subsidence	Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness			Uncoated steel	Concrete
					Ft			In		In			
ArB:													
Argonne	B	None	---	---	1.5-3.5	Perched	Sep-Jun	>60	---	---	Moderate	Moderate	High.
Sarwet	B	None	---	---	2.5-3.5	Perched	Sep-Jun	>60	---	---	Moderate	Moderate	High.
Au Au Gres	B	None	---	---	0.5-1.5	Apparent	Oct-May	>60	---	---	Moderate	Low	Moderate.
Ca Capitola	B/D	None	---	---	+1-1.0	Perched	Sep-Jun	>60	---	---	High	High	High.
CrA Croswell	A	None	---	---	2.0-3.5	Apparent	Nov-May	>60	---	---	Low	Low	Moderate.
CuA Cublake	A	None	---	---	2.0-3.5	Perched	Oct-May	>60	---	---	Low	Low	Moderate.
FeB Fence	B	None	---	---	2.5-3.5	Perched	Sep-Jun	>60	---	---	High	Low	High.
FlA Flink	B	None	---	---	1.0-2.0	Perched	Sep-Jun	>60	---	---	Moderate	Moderate	High.
Fm Fordum	D	Frequent	Brief or long.	Mar-Jun	+1-1.0	Apparent	Jan-Dec	>60	---	---	High	High	High.
GaA Gastrow	C	None	---	---	0.5-2.0	Apparent	Sep-Jun	>60	---	---	High	Low	Moderate.
Kr Kinross	A/D	None	---	---	+1-1.0	Apparent	Oct-May	>60	---	---	Moderate	High	Moderate.
LaC, LaD:													
Laona	B	None	---	---	>6.0	---	---	>60	---	---	Moderate	Low	High.
Sarona	B	None	---	---	>6.0	---	---	>60	---	---	Moderate	Low	Moderate.
Lo:													
Loxley	A/D	None	---	---	+1-1.0	Apparent	Sep-Jun	>60	---	50-55	High	High	High.
Beseman	A/D	None	---	---	+1-1.0	Apparent	Sep-Jun	>60	---	12-36	High	High	High.
Dawson	A/D	None	---	---	+1-1.0	Apparent	Sep-Jun	>60	---	30-36	High	High	High.

Table 18.--Soil and Water Features--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Total subsidence	Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness			Uncoated steel	Concrete
					Ft			In		In			
Lu:													
Lupton	A/D	None	---	---	+1-1.0	Apparent	Oct-May	>60	---	50-55	High	High	Low.
Cathro	A/D	None	---	---	+1-1.0	Apparent	Oct-May	>60	---	19-22	High	High	Low.
Markey	A/D	None	---	---	+1-1.0	Apparent	Oct-May	>60	---	25-30	High	High	Low.
MaA--Manitowish	B	None	---	---	2.5-3.5	Apparent	Sep-Jun	>60	---	---	Low	Low	Moderate.
MeD:													
Metonga	B	None	---	---	>6.0	---	---	20-40	Hard	---	Moderate	Low	High.
Rock outcrop.													
Mn--Minocqua	B/D	None	---	---	+1-1.0	Apparent	Oct-Jun	>60	---	---	High	High	High.
MuB--Mudlake	C	None	---	---	0.5-2.0	Perched	Sep-Jun	>60	---	---	High	Moderate	High.
PaB, PaC, PaD--Padus	B	None	---	---	>6.0	---	---	>60	---	---	Moderate	Low	Moderate.
PeB, PeC, PeD:													
Padus	B	None	---	---	>6.0	---	---	>60	---	---	Moderate	Low	Moderate.
Pence	B	None	---	---	>6.0	---	---	>60	---	---	Low	Low	Moderate.
PfD:													
Padus	B	None	---	---	>6.0	---	---	>60	---	---	Moderate	Low	Moderate.
Soperton	B	None	---	---	>6.0	---	---	>60	---	---	Moderate	Low	High.
PgB, PgC:													
Padus	B	None	---	---	>6.0	---	---	>60	---	---	Moderate	Low	Moderate.
Wabeno	B	None	---	---	1.5-3.0	Perched	Oct-Jun	>60	---	---	Moderate	Moderate	High.
PhB--Padwood	B	None	---	---	2.5-3.5	Perched	Oct-May	>60	---	---	Moderate	Moderate	High.
PkE--Pelissier	A	None	---	---	>6.0	---	---	>60	---	---	Low	Low	Moderate.

Table 18.--Soil and Water Features--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Total subsidence	Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness			Uncoated steel	Concrete
					Ft			In		In			
PnB, PnC, PnD---Pence	B	None	---	---	>6.0	---	---	>60	---	---	Low	Low	Moderate.
PsB, PsC, PsD:													
Pence	B	None	---	---	>6.0	---	---	>60	---	---	Low	Low	Moderate.
Vilas	A	None	---	---	>6.0	---	---	>60	---	---	Low	Low	High.
Pt. Pits, gravel													
RuD---Rubicon	A	None	---	---	>6.0	---	---	>60	---	---	Low	Low	High.
SoD:													
Soperton	B	None	---	---	>6.0	---	---	>60	---	---	Moderate	Low	High.
Goodman	B	None	---	---	>6.0	---	---	>60	---	---	Moderate	Low	High.
SpD:													
Soperton	B	None	---	---	>6.0	---	---	>60	---	---	Moderate	Low	High.
Mudlake	C	None	---	---	0.5-2.0	Perched	Sep-Jun	>60	---	---	High	Moderate	High.
StB, StC, StD---Stambaugh	B	None	---	---	>6.0	---	---	>60	---	---	Moderate	Low	Moderate.
TpA---Tipler	B	None	---	---	2.5-3.5	Apparent	Sep-Jun	>60	---	---	Moderate	Moderate	High.
VaB---Vanzile	B	None	---	---	>6.0	---	---	>60	---	---	Moderate	Low	Moderate.
VsB, VsC---Vilas	A	None	---	---	>6.0	---	---	>60	---	---	Low	Low	High.
WaC:													
Wabeno	B	None	---	---	1.5-3.0	Perched	Oct-Jun	>60	---	---	Moderate	Moderate	High.
Goodman	B	None	---	---	>6.0	---	---	>60	---	---	Moderate	Low	High.
WbB:													
Wabeno	B	None	---	---	1.5-3.0	Perched	Oct-Jun	>60	---	---	Moderate	Moderate	High.
Goodwit	B	None	---	---	2.5-3.5	Perched	Sep-Jun	>60	---	---	Moderate	Low	High.

Table 18.--Soil and Water Features--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Total subsidence	Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness			Uncoated steel	Concrete
					Ft			In		In			
WdB:													
Wabeno	B	None	---	---	1.5-3.0	Perched	Oct-Jun	>60	---	---	Moderate	Moderate	High.
Mudlake	C	None	---	---	0.5-2.0	Perched	Sep-Jun	>60	---	---	High	Moderate	High.
WhA---Whisklake	C	None	---	---	0.5-2.0	Apparent	Sep-Jun	>60	---	---	High	High	High.
WrA---Worcester	C	None	---	---	0.5-2.0	Apparent	Oct-Jun	>60	---	---	High	High	High.
WtA---Wormet	B	None	---	---	0.5-2.0	Apparent	Oct-Jun	>60	---	---	Moderate	Moderate	High.

Table 19.--Engineering Index Test Data

(Dashes indicate that data were not available. MAX means maximum dry density; OPT, optimum moisture; LL, liquid limit; PI, plasticity index; NP, nonplastic; and UN, Unified)

Soil name and location	Parent material	Report number	Depth	Moisture density		Percentage passing sieve--*				Percentage smaller than--*				LL	PI	Classification	
				MAX	OPT	No. 4	No. 10	No. 40	No. 200	0.05 mm	0.02 mm	0.005 mm	0.002 mm			AASHTO	UN
			In	Lb/ft^3	Pct									Pct			
Capitola muck: NW1/4SW1/4 sec. 32, T. 38 N., R. 12 E.	Primarily silty deposits underlain by sandy or loamy glacial till or glacial mudflow sediment.	S72WI-041-4-1	16-31	---	---	93	91	79	25	21	15	10	9	---	NP	A-2-4(0)	SM
Goodwit silt loam: SW1/4SW1/4 sec. 10, T. 35 N., R. 16 E.	Silty deposits underlain by sandy or loamy glacial till or glacial mudflow sediment.	S90WI-041-1-5	26-35	---	---	99	98	93	62	50	28	12	8	19.2	NP	A-4(5)	ML
		1-8	63-80	---	---	92	87	68	28	24	18	10	8	14.5	NP	A-2-4(0)	SM
Goodwit silt loam: SW1/4SW1/4 sec. 10, T. 35 N., R. 16 E.	Silty deposits underlain by sandy or loamy glacial till or glacial mudflow sediment.	S90WI-041-3-4	10-18	---	---	97	96	94	87	78	40	14	8	24.4	NP	A-4(8)	ML
		3-6	26-35	---	---	97	97	95	86	69	39	18	13	23.9	NP	A-4(8)	ML
		3-10	73-83	---	---	82	78	62	23	20	14	9	7	13.4	NP	A-2-4(0)	SM
Goodwit silt loam: SW1/4SW1/4 sec. 10, T. 35 N., R. 16 E.	Silty deposits underlain by sandy or loamy glacial till or glacial mudflow sediment.	S90WI-041-4-4	5-11	---	---	98	98	94	81	65	35	13	7	28.6	NP	A-4(8)	ML
		4-6	15-22	---	---	84	79	64	29	24	16	8	5	14.0	NP	A-2-4(0)	SM
		4-8	36-47	---	---	81	76	60	22	18	12	6	4	11.4	NP	A-2-4(0)	SM
		4-9	47-65	---	---	83	78	62	24	21	15	9	7	14.4	NP	A-2-4(0)	SM

See footnote at end of table.

Table 19.--Engineering Index Test Data--Continued

Soil name and location	Parent material	Report number	Depth	Moisture density		Percentage passing sieve--*				Percentage smaller than--*				LL	PI	Classification	
				MAX	OPT	No. 4	No. 10	No. 40	No. 200	0.05 mm	0.02 mm	0.005 mm	0.002 mm			AASHTO	UN
			In	Lb/ft^3	Pct									Pct			
Stambaugh silt loam:																	
NE1/4NW1/4 sec. 12, T. 40 N., R. 13 E.	Primarily silty deposits underlain by sandy and gravelly glacial outwash.	S60WI-041-10-1	4-12	---	---	100	100	97	93	87	51	17	10	28.0	3	A-4(8)	ML
		10-3	17-40	---	---	100	100	97	84	78	43	14	14	27.0	7	A-4(8)	CL-ML
Vilas loamy sand:																	
SE1/4SE1/4 sec. 5, T. 40 N., R. 13 E.	Sandy glacial outwash.	S60WI-041-12-1	5-12	---	---	81	81	69	13	11	7	4	2	---	NP	A-2-4(0)	SM
		12-2	12-60	---	---	90	90	77	9	8	5	2	1	---	NP	A-3(0)	SP-SM
Wabeno silt loam:																	
SW1/4SW1/4 sec. 10, T. 35 N., R. 16 E.	Silty deposits underlain by sandy or loamy glacial till or glacial mudflow sediment.	S85WI-041-8-3	16-23	---	---	100	100	97	81	69	38	21	16	27.3	6.2	A-4(8)	CL-ML
		8-4	33-60	---	---	84	78	62	26	22	16	10	7	13.9	NP	A-2-4(0)	SM
Wabeno silt loam:																	
SW1/4SW1/4 sec. 20, T. 35 N., R. 15 E.	Silty deposits underlain by sandy or loamy glacial till or glacial mudflow sediment.	S87WI-041-133-5	17-22	---	---	92	90	82	57	43	25	9	7	---	NP	A-4(4)	ML
		133-8	35-60	---	---	87	82	67	21	16	10	5	3	---	NP	A-2-4(0)	SM

See footnote at end of table.

Table 19.--Engineering Index Test Data--Continued

Soil name and location	Parent material	Report number	Depth	Moisture density		Percentage passing sieve--*				Percentage smaller than--*				LL	PI	Classification	
				MAX	OPT	No. 4	No. 10	No. 40	No. 200	0.05 mm	0.02 mm	0.005 mm	0.002 mm			AASHTO	UN
			In	Lb/ft^3	Pct									Pct			
Wabeno silt loam:																	
NW1/4SW1/4 sec. 35, T. 35 N., R. 15 E.	Silty deposits underlain by sandy or loamy glacial till or glacial mudflow sediment.	S90WI-041-10-3	9-17	---	---	98	96	89	67	56	30	11	6	22.3	NP	A-4(6)	ML
		10-5	29-40	---	---	90	86	67	21	18	13	7	5	12.2	NP	A-2-4(0)	SM
		10-7	60-84	---	---	86	82	65	19	17	13	7	6	12.6	NP	A-2-4(0)	SM

* Mechanical analysis according to the AASHTO Designation T88-57. Results from this procedure can differ somewhat from the results obtained by the soil survey procedure of the Natural Resources Conservation Service (NRCS). In the AASHTO procedure, the fine material is analyzed by hydrometer method and the various grain-size fractions are calculated on the basis of all material up to and including that 3 inches in diameter. In the NRCS soil survey procedure, the fine material is analyzed by the pipette method and the material coarser than 2 millimeters in diameter is excluded from the calculation of grain-size fraction. The mechanical analysis data used in this table are not suitable for use in naming textural classes of soils.

Table 20.--Classification of the Soils

Soil name	Family or higher taxonomic class
Argonne	Coarse-loamy, mixed, frigid Oxyaquic Fragiorthods
Au Gres	Sandy, mixed, frigid Typic Endoaquods
Beseman	Loamy, mixed, dysic Terric Borosaprists
Capitola	Coarse-loamy, mixed, frigid Mollic Epiaqualfs
Cathro	Loamy, mixed, euic Terric Borosaprists
Croswell	Sandy, mixed, frigid Oxyaquic Haplorthods
Cublake	Sandy, mixed, frigid Oxyaquic Haplorthods
Dawson	Sandy or sandy-skeletal, mixed, dysic Terric Borosaprists
Fence	Coarse-silty, mixed, frigid Oxyaquic Haplorthods
Flink	Sandy, mixed, frigid Typic Epiaquods
Fordum	Coarse-loamy, mixed, nonacid, frigid Mollic Fluvaquents
Gastrow	Coarse-loamy, mixed, frigid Argic Endoaquods
Goodman	Coarse-loamy, mixed, frigid Alfic Haplorthods
Goodwit	Coarse-loamy, mixed, frigid Oxyaquic Haplorthods
Kinross	Sandy, mixed, frigid Typic Endoaquods
Laona	Coarse-loamy, mixed, frigid Alfic Fragiorthods
Loxley	Dysic Typic Borosaprists
Lupton	Euic Typic Borosaprists
Manitowish	Sandy, mixed, frigid Oxyaquic Haplorthods
Markey	Sandy or sandy-skeletal, mixed, euic Terric Borosaprists
Metonga	Coarse-loamy, mixed, frigid Entic Haplorthods
Minocqua	Coarse-loamy over sandy or sandy-skeletal, mixed, nonacid, frigid Typic Endoaquepts
Mudlake	Coarse-loamy, mixed, frigid Alfic Epiaquods
Padus	Coarse-loamy, mixed, frigid Alfic Haplorthods
Padwood	Coarse-loamy, mixed, frigid Oxyaquic Haplorthods
Pelissier	Sandy-skeletal, mixed, frigid Entic Haplorthods
Pence	Sandy, mixed, frigid Entic Haplorthods
Rubicon	Sandy, mixed, frigid Entic Haplorthods
Sarona	Coarse-loamy, mixed, frigid Alfic Haplorthods
Sarwet	Coarse-loamy, mixed, frigid Oxyaquic Haplorthods
Soperton	Coarse-loamy, mixed, frigid Alfic Fragiorthods
Stambaugh	Coarse-silty over sandy or sandy-skeletal, mixed, frigid Alfic Haplorthods
Tipler	Coarse-loamy, mixed, frigid Oxyaquic Haplorthods
Vanzile	Coarse-silty over sandy or sandy-skeletal, mixed, frigid Alfic Haplorthods
Vilas	Sandy, mixed, frigid Entic Haplorthods
Wabeno	Coarse-loamy, mixed, frigid Oxyaquic Fragiorthods
Whisklake	Coarse-loamy over sandy or sandy-skeletal, mixed, frigid Argic Endoaquods
Worcester	Coarse-loamy, mixed, frigid Argic Endoaquods
Wormet	Sandy, mixed, frigid Typic Endoaquods

N

SECTIONALIZED TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

INDEX TO MAP SHEETS

FOREST COUNTY, WISCONSIN

Scale 1:150000

1 0 1 2 3

MILES

1 0 1 2 3 4 5 6

KILOMETERS

SOIL LEGEND

Map symbols consist of a combination of uppercase and lowercase letters. The first letter in the map symbol is uppercase and is the initial letter of the map unit name. The second letter is lowercase and separates map units having names that begin with the same letter, except that it does not separate slope phases. Some map symbols have a third letter, which is uppercase and indicates the class of slope. Map symbols without a third letter indicating slope class are for nearly level soils or for miscellaneous areas.

SYMBOL	NAME
ArB	Argonne-Sarwet sandy loams, 1 to 6 percent slopes, very stony
Au	Au Gres loamy sand, 0 to 2 percent slopes
Ca	Capitola muck, 0 to 2 percent slopes, very stony
CrA	Croswell loamy sand, 0 to 3 percent slopes
CuA	Cublake loamy sand, 0 to 3 percent slopes
FeB	Fence silt loam, 0 to 6 percent slopes
FlA	Flink loamy sand, 0 to 3 percent slopes
Fm	Fordum loam, 0 to 2 percent slopes
GaA	Gastrow silt loam, 0 to 3 percent slopes
Kr	Kinross muck, 0 to 2 percent slopes
LaC	Laona-Sarona sandy loams, 6 to 15 percent slopes, very stony
LaD	Laona-Sarona sandy loams, 15 to 35 percent slopes, very stony
Lo	Loxley, Beseman, and Dawson peats, 0 to 1 percent slopes
Lu	Lupton, Cathro, and Markey mucks, 0 to 1 percent slopes
M-W	Miscellaneous water
MaA	Manitowish sandy loam, 0 to 3 percent slopes
MeD	Metonga-Rock outcrop complex, 4 to 60 percent slopes, very stony
Mn	Minocqua muck, 0 to 2 percent slopes
MuB	Mudlake silt loam, 1 to 6 percent slopes, very stony
PaB	Padus sandy loam, 0 to 6 percent slopes
PaC	Padus sandy loam, 6 to 15 percent slopes
PaD	Padus sandy loam, 15 to 35 percent slopes
PeB	Padus-Pence sandy loams, 0 to 6 percent slopes
PeC	Padus-Pence sandy loams, 6 to 15 percent slopes
PeD	Padus-Pence sandy loams, 15 to 35 percent slopes
PfD	Padus-Soperton silt loams, 15 to 35 percent slopes, very stony
PgB	Padus-Wabeno silt loams, 1 to 6 percent slopes, very stony
PgC	Padus-Wabeno silt loams, 6 to 15 percent slopes, very stony
PhB	Padwood sandy loam, 0 to 6 percent slopes
PkE	Pelissier gravelly sandy loam, 20 to 45 percent slopes, stony
PnB	Pence sandy loam, 0 to 6 percent slopes
PnC	Pence sandy loam, 6 to 15 percent slopes
PnD	Pence sandy loam, 15 to 35 percent slopes
PsB	Pence-Vilas complex, 0 to 6 percent slopes
PsC	Pence-Vilas complex, 6 to 15 percent slopes
PsD	Pence-Vilas complex, 15 to 35 percent slopes
Pt	Pits, gravel
RuD	Rubicon loamy sand, 15 to 35 percent slopes
SoD	Soperton-Goodman silt loams, 15 to 35 percent slopes, very stony
SpD	Soperton-Mudlake silt loams, 1 to 35 percent slopes, very stony
StB	Stambaugh silt loam, 0 to 6 percent slopes
StC	Stambaugh silt loam, 6 to 15 percent slopes
StD	Stambaugh silt loam, 15 to 25 percent slopes
TpA	Tipler sandy loam, 0 to 3 percent slopes
VaB	Vanzile silt loam, 0 to 6 percent slopes
VsB	Vilas loamy sand, 0 to 6 percent slopes
VsC	Vilas loamy sand, 6 to 15 percent slopes
WaC	Wabeno-Goodman silt loams, 6 to 15 percent slopes, very stony
WbB	Wabeno-Goodwit silt loams, 1 to 6 percent slopes, very stony
WdB	Wabeno-Mudlake silt loams, 1 to 15 percent slopes, very stony
WhA	Whisklake silt loam, 0 to 3 percent slopes
WrA	Worcester sandy loam, 0 to 3 percent slopes
WtA	Wormet sandy loam, 0 to 3 percent slopes
W	Water

CONVENTIONAL AND SPECIAL SYMBOLS LEGEND

CULTURAL FEATURES

BOUNDARIES

- National, state, or province
- County or parish
- Minor civil division
- Reservation (national forest or park, state forest or park)
- Land grant
- Limit of soil survey (lable) and/or denied access area
- Field sheet matchline & neatline
- Previously Published Survey

OTHER BOUNDARY (label)

- Airport, airfield
- Cemetery
- City/county park

STATE COORDINATE TICK
1 890 000 FEET

LAND DIVISION CORNER
(section and land grants)

GEOGRAPHIC COORDINATE TICK

TRANSPORTATION

- Divided roads
- Other roads
- Trail

ROAD EMBLEM & DESIGNATIONS

- Interstate (173; 79, 345)
- Federal (287; 410, 224)
- State (52; 52, 147)
- County, farm, or ranch (1283)

RAILROAD

POWER TRANSMISSION LINE
(normally not shown)

PIPE LINE (normally not shown)

FENCE (normally not shown)

LEVEES

- Without road
- With road
- With railroad
- Single side slope (showing actual feature location)

DAMS

- Medium or Small

LANDFORM FEATURES

- Prominent hill or peak
- Soil sample site

MISCELLANEOUS CULTURAL FEATURES

- Farmstead, house (omit in urban areas)
- Church
- School
- Other Religion (label) (Mt Carmel)
- Located object (label) (Ranger Station)
- Tank (label) (Petroleum)
- Lookout Tower
- Oil and/or Natural Gas Wells
- Windmill
- Lighthouse

HYDROGRAPHIC FEATURES

STREAMS

- Perennial, double line
- Perennial, single line
- Intermittent
- Drainage end

DRAINAGE AND IRRIGATION

- Double-line canal (label) (CANAL)
- Perennial drainage and/or irrigation ditch
- Intermittent drainage and/ or irrigation ditch

SMALL LAKES, PONDS AND RESERVOIRS

- Perennial water
- Miscellaneous water
- Flood pool line (FLOOD POOL LINE)

MISCELLANEOUS WATER FEATURES

- Spring
- Well, artesian
- Well, irrigation

SPECIAL SYMBOLS FOR SOIL SURVEY AND SSURGO

SOIL DELINEATIONS AND SYMBOLS (FeB, Kr)

LANDFORM FEATURES

ESCARPMENTS

- Bedrock
- Other than bedrock

SHORT STEEP SLOPE

GULLY

DEPRESSION, closed

SINKHOLE

EXCAVATIONS

PITS

- Borrow pits
- Gravel pit
- Mine or quarry

LANDFILL

MISCELLANEOUS SURFACE FEATURES

- Blowout
- Clay spot
- Gravelly spot
- Lava flow
- Marsh or swamp
- Rock outcrop (includes sandstone and shale)
- Saline spot
- Sandy spot
- Severely eroded spot
- Slide or slip
- Sodic spot
- Spoil area
- Stony spot
- Very stony spot
- Wet spot
- Cut area
- Dry spot
- Fill area
- Island

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

FOREST COUNTY, WISCONSIN

SMOKY LAKE NE QUADRANGLE
SHEET NUMBER 1
3.75 MINUTE SERIES



(Joins sheet 2, Smoky Lake SE)

This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from year 1992 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER

Scale 1:12000

Digital Data: UTM Coordinate System Zone: zone:16
Polyconic Projection
1983 North American Datum

N

SHEET NUMBER 1 OF 98
FOREST COUNTY, WISCONSIN
SMOKY LAKE NE QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

FOREST COUNTY, WISCONSIN

SMOKY LAKE SE QUADRANGLE
SHEET NUMBER 2
3.75 MINUTE SERIES

(Joins sheet 1, Smoky Lake NE)



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1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER

Scale 1:12000

Digital Data: UTM Coordinate System Zone: zone:16
Polyconic Projection
1983 North American Datum

N

SHEET NUMBER 2 OF 98
FOREST COUNTY, WISCONSIN
SMOKY LAKE SE QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

FOREST COUNTY, WISCONSIN
HAGERMAN LAKE SW QUADRANGLE
SHEET NUMBER 3
3.75 MINUTE SERIES



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1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER

Scale 1:12000

Digital Data: UTM Coordinate System Zone: zone:16
Polyconic Projection
1983 North American Datum

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SHEET NUMBER 3 OF 98
FOREST COUNTY, WISCONSIN
HAGERMAN LAKE SW QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

FOREST COUNTY, WISCONSIN

HAGERMAN LAKE SE QUADRANGLE
SHEET NUMBER 4
3.75 MINUTE SERIES

88°48'45"W 88°47'30"W R. 36 W. 88°46'15"W 88°45'W
46°3'45"N 46°3'45"N
T. 42 N. T. 42 N.
46°2'30"N 46°2'30"N
(Joins sheet 3, Hagerman Lake SW) (Joins sheet 5, Iron River SW)
46°1'15"N 46°1'15"N
T. 41 N. T. 41 N.
46°N 46°N
88°48'45"W R. 13 E. R. 14 E. 88°47'30"W 88°46'15"W 88°45'W

(Joins sheet 11, Alvin NE)

This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from year 1992 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER

Scale 1:12000

Digital Data: UTM Coordinate System Zone: zone:16
Polyconic Projection
1983 North American Datum

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SHEET NUMBER 4 OF 98
FOREST COUNTY, WISCONSIN
HAGERMAN LAKE SE QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
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FOREST COUNTY, WISCONSIN
IRON RIVER SW QUADRANGLE
SHEET NUMBER 5
3.75 MINUTE SERIES

88°45'W
46°3'45"N
R. 36 E. | R. 35 E.
88°43'45"W
88°42'30"W
88°41'15"W
46°3'45"N
T. 42 N.
46°2'30"N
(Joins sheet 4, Hagerman Lake SE)
(Joins sheet 6, Iron River SE)
T. 42 N.
46°2'30"N
46°1'15"N
T. 41 N.
T. 41 N.
46°1'15"N
NICOLET NATIONAL FOREST
MICHIGAN
Brule River
Allen Creek
COUNTY
TOWN
46°N
88°45'W
88°43'45"W
R. 14 E.
88°42'30"W
88°41'15"W
46°N
(Joins sheet 12, Tipler NW)

This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from year 1992 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER

Scale 1:12000

Digital Data: UTM Coordinate System Zone: zone:16
Polyconic Projection
1983 North American Datum

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SHEET NUMBER 5 OF 98
FOREST COUNTY, WISCONSIN
IRON RIVER SW QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

FOREST COUNTY, WISCONSIN
IRON RIVER SE QUADRANGLE
SHEET NUMBER 6
3.75 MINUTE SERIES



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1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER

Scale 1:12000

Digital Data: UTM Coordinate System Zone: zone:16
Polyconic Projection
1983 North American Datum

N

SHEET NUMBER 6 OF 98
FOREST COUNTY, WISCONSIN
IRON RIVER SE QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

FOREST COUNTY, WISCONSIN
ANVIL LAKE NE QUADRANGLE
SHEET NUMBER 7
3.75 MINUTE SERIES



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1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER

Scale 1:12000

Digital Data: UTM Coordinate System Zone: zone:16
Polyconic Projection
1983 North American Datum

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SHEET NUMBER 7 OF 98
FOREST COUNTY, WISCONSIN
ANVIL LAKE NE QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

FOREST COUNTY, WISCONSIN

ALVIN NW NW QUADRANGLE
SHEET NUMBER 8
3.75 MINUTE SERIES



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1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER

Scale 1:12000

Digital Data: UTM Coordinate System Zone: zone:16
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1983 North American Datum

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SHEET NUMBER 8 OF 98
FOREST COUNTY, WISCONSIN
ALVIN NW NW QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

FOREST COUNTY, WISCONSIN

ALVIN NW NE QUADRANGLE
SHEET NUMBER 9
3.75 MINUTE SERIES



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1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER

Scale 1:12000

Digital Data: UTM Coordinate System Zone: zone:16
Polyconic Projection
1983 North American Datum

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SHEET NUMBER 9 OF 98
FOREST COUNTY, WISCONSIN
ALVIN NW NE QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

FOREST COUNTY, WISCONSIN

ALVIN NW QUADRANGLE
SHEET NUMBER 10
3.75 MINUTE SERIES

(Joins sheet 3, Hagerman Lake SW)



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1 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 0 1 KILOMETER

Scale 1:12000

Digital Data: UTM Coordinate System Zone: zone:16
Polyconic Projection
1983 North American Datum

N

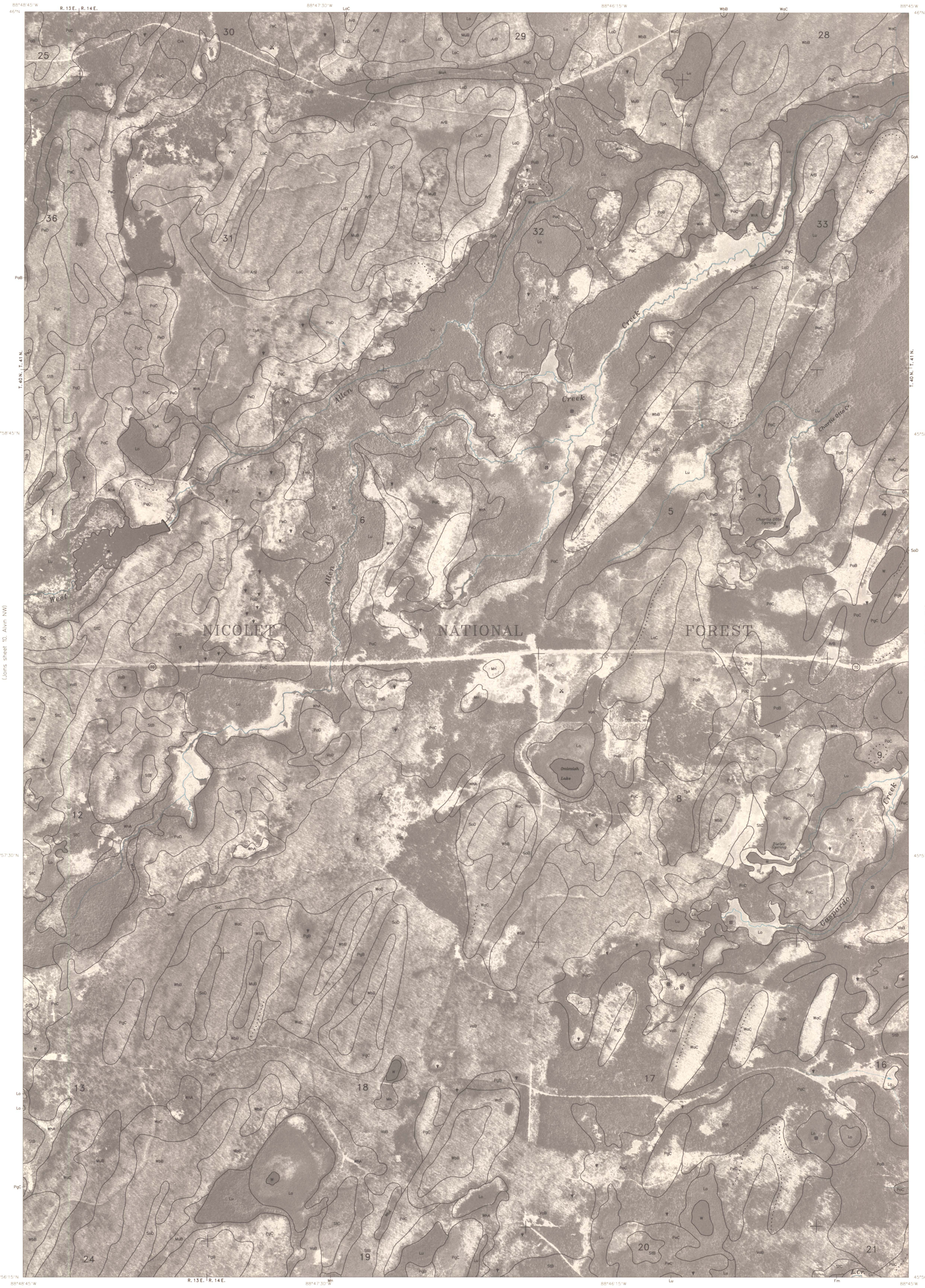
SHEET NUMBER 10 OF 98
FOREST COUNTY, WISCONSIN
ALVIN NW QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

FOREST COUNTY, WISCONSIN

ALVIN NE QUADRANGLE
SHEET NUMBER 11
3.75 MINUTE SERIES

(Joins sheet 4, Hagerman Lake SE)



This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from year 1992 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER

Scale 1:12000

Digital Data: UTM Coordinate System Zone: zone:16
Polyconic Projection
1983 North American Datum

N

SHEET NUMBER 11 OF 98
FOREST COUNTY, WISCONSIN
ALVIN NE QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

FOREST COUNTY, WISCONSIN

TIPLER NW QUADRANGLE
SHEET NUMBER 12
3.75 MINUTE SERIES

(Joins sheet 5, Iron River SW)

88°45'W
46°N
88°43'45"W
R. 14 E.
88°42'30"W
88°41'15"W
46°N

(Joins sheet 11, Alvin NE)
(Joins sheet 13, Tipler NE)

T. 40 N., T. 41 N.

45°58'45"N
45°57'30"N
45°56'15"N

NICOLET NATIONAL FOREST

Allen Creek
Dhamble Otto Creek
Creek
Ramsdell Lake
Gaspardo
Hust
Creek
Lillypad
Lillypad Lake
Mud Lake
Creek
Chuke Lake

(Joins sheet 19, Tipler SW)

This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from year 1992 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER

Scale 1:12000

Digital Data: UTM Coordinate System Zone: zone:16
Polyconic Projection
1983 North American Datum

N

SHEET NUMBER 12 OF 98
FOREST COUNTY, WISCONSIN
TIPLER NW QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

FOREST COUNTY, WISCONSIN
TIPLER NE QUADRANGLE
SHEET NUMBER 13
3.75 MINUTE SERIES

(Joins sheet 6, Iron River SE)

88°41'15"W
46°N
R. 14 E.
R. 15 E.
88°40'W
88°38'45"W
88°37'30"W
46°N

25
36
12
13
24

T. 40 N.
T. 41 N.

Creek
Creek
Creek

FOREST
NATIONAL
NICOLET
COUNTY
FLORENCE

45°58'45"N
45°57'30"N
45°56'15"N

(Joins sheet 12, Tipler NW)

(Joins sheet 20, Tipler SE)

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1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER

Scale 1:12000

Digital Data: UTM Coordinate System Zone: zone:16
Polyconic Projection
1983 North American Datum

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SHEET NUMBER 13 OF 98
FOREST COUNTY, WISCONSIN
TIPLER NE QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

FOREST COUNTY, WISCONSIN
ANVIL LAKE SE QUADRANGLE
SHEET NUMBER 14
3.75 MINUTE SERIES

(Joins sheet 7, Anvil Lake NE)

89°3'45"W 45°56'15"N — R. 11 E. — R. 12 E. — 89°2'30"W — 89°1'15"W — 89°W 45°56'15"N

Creek
Ninemile
Franklin Lake
Gertrude Lake
Butternut Lake
Echo Lake
Upper Ninemile Lake
Pat Shay Lake
Sevenmile Lake
Harmony Lake
Hay Meadow Flowage
Hay Meadow Cr.
NICOLET NATIONAL FOREST
ONEIDA COUNTY
VILAS COUNTY

19 20 21 28 30 29 31 32 33 6 5 4 7 8 9

45°55'N — 45°53'45"N — T. 40 N. — T. 39 N. — 45°52'30"N

(Joins sheet 15, Alvin NW SW)

(Joins sheet 21, Julia Lake NE)

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1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER

Scale 1:12000

Digital Data: UTM Coordinate System Zone: zone:16
Polyconic Projection
1983 North American Datum

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SHEET NUMBER 14 OF 98
FOREST COUNTY, WISCONSIN
ANVIL LAKE SE QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

FOREST COUNTY, WISCONSIN

ALVIN NW SW QUADRANGLE
SHEET NUMBER 15
3.75 MINUTE SERIES

(Joins sheet 8, Alvin NW NW)

89°W
45°56'15"N
88°58'45"W
R. 12 E.
88°57'30"W
88°56'15"W
45°56'15"N

Franklin Lake
Bose Lake
Howell Creek
Three Johns Lake
McKinley Lake
Two Sisters Lakes
Gertrude Lake
Butternut Lake
Luna Lake
Indian Camp Lake
Harmony Lake
Harriet Lake
White Deer Lake
Mayflower Lake
Four Ducks Lake
Lone Wolf lake
Hay Meadow
N. Br. McD. Cr.
McDonald Cr.
Z. Br. P. R.

21 22 23 24 25 26 27 28 33 34 35 36 1 2 3 4 9 10 11 12

45°55'N
45°53'45"N
T. 40 N.
T. 39 N.

NICOLET NATIONAL FOREST

(Joins sheet 14, Anvil Lake SE)
(Joins sheet 16, Alvin NW SE)

45°52'30"N
89°W
88°58'45"W
R. 12 E.
88°57'30"W
88°56'15"W
45°52'30"N

(Joins sheet 22, Alvin SW NW)

This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from year 1992 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER

Scale 1:12000

Digital Data: UTM Coordinate System Zone: zone:16
Polyconic Projection
1983 North American Datum

N

SHEET NUMBER 15 OF 89
FOREST COUNTY, WISCONSIN
ALVIN NW SW QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

FOREST COUNTY, WISCONSIN

ALVIN NW SE QUADRANGLE
SHEET NUMBER 16
3.75 MINUTE SERIES

(Joins sheet 9, Alvin NW NE)



This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from year 1992 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

1 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 0 1 KILOMETER

Scale 1:12000

Digital Data: UTM Coordinate System Zone: zone:16
Polyconic Projection
1983 North American Datum

N

SHEET NUMBER 16 OF 98
FOREST COUNTY, WISCONSIN
ALVIN NW SE QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

FOREST COUNTY, WISCONSIN
ALVIN SW QUADRANGLE
SHEET NUMBER 17
3.75 MINUTE SERIES

(Joins sheet 10, Alvin NW)



(Joins sheet 24, Alvin SE NW)

This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from year 1992 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER

Scale 1:12000

Digital Data: UTM Coordinate System Zone: zone:16
Polyconic Projection
1983 North American Datum

N

SHEET NUMBER 17 OF 98
FOREST COUNTY, WISCONSIN
ALVIN SW QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

FOREST COUNTY, WISCONSIN

ALVIN SE QUADRANGLE
SHEET NUMBER 18
3.75 MINUTE SERIES

(Joins sheet 11, Alvin NE)



(Joins sheet 17, Alvin SW)

(Joins sheet 19, Tipler SW)

(Joins sheet 25, Alvin SE NE)

This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from year 1992 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER

Scale 1:12000

Digital Data: UTM Coordinate System Zone: zone:16
Polyconic Projection
1983 North American Datum

N

SHEET NUMBER 18 OF 98
FOREST COUNTY, WISCONSIN
ALVIN SE QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

FOREST COUNTY, WISCONSIN
TIPLER SW QUADRANGLE
SHEET NUMBER 19
3.75 MINUTE SERIES



This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from year 1992 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER

Scale 1:12000

Digital Data: UTM Coordinate System Zone: zone:16
Polyconic Projection
1983 North American Datum

N

SHEET NUMBER 19 OF 98
FOREST COUNTY, WISCONSIN
TIPLER SW QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

FOREST COUNTY, WISCONSIN

TIPLER SE QUADRANGLE
SHEET NUMBER 20
3.75 MINUTE SERIES

(Joins sheet 13, Tipler NE)

88°43'15"W 45°56'15"N — R. 14 E. / R. 15 E. — 88°40'W — 88°38'45"W — 88°37'30"W 45°56'15"N

45°55'N — 45°55'N

(Joins sheet 19, Tipler S.W.)

T. 40 N. — T. 40 N.

45°53'45"N — 45°53'45"N

T. 39 N. — T. 39 N.

88°43'15"W 45°52'30"N — R. 14 E. / R. 15 E. — 88°40'W — 88°38'45"W — 88°37'30"W 45°52'30"N

(Joins sheet 27, Long Lake NE)

This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from year 1992 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

1 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 0 1 KILOMETER

Scale 1:12000

Digital Data: UTM Coordinate System Zone: zone:16
Polyconic Projection
1983 North American Datum

N

SHEET NUMBER 20 OF 98
FOREST COUNTY, WISCONSIN
TIPLER SE QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

FOREST COUNTY, WISCONSIN

JULIA LAKE NE QUADRANGLE
SHEET NUMBER 21
3.75 MINUTE SERIES

(Joins sheet 14, Anvil Lake SE)



(Joins sheet 22, Alvin SW NW)

(Joins sheet 28, Julia Lake SE)

This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from year 1992 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER

Scale 1:12000

Digital Data: UTM Coordinate System Zone: zone:16
Polyconic Projection
1983 North American Datum

N

SHEET NUMBER 21 OF 98
FOREST COUNTY, WISCONSIN
JULIA LAKE NE QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

FOREST COUNTY, WISCONSIN

ALVIN SW NW QUADRANGLE
SHEET NUMBER 22
3.75 MINUTE SERIES



This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from year 1992 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

1 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 0 1 KILOMETER

Scale 1:12000

Digital Data: UTM Coordinate System Zone: zone:16
Polyconic Projection
1983 North American Datum

N

SHEET NUMBER 22 OF 98
FOREST COUNTY, WISCONSIN
ALVIN SW NW QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

FOREST COUNTY, WISCONSIN

ALVIN SW NE QUADRANGLE
SHEET NUMBER 23
3.75 MINUTE SERIES

(Joins sheet 16, Alvin NW SE)



(Joins sheet 22, Alvin SW NW)
(Joins sheet 24, Alvin SE NW)
(Joins sheet 30, Alvin SW SE)

This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from year 1992 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER

Scale 1:12000

Digital Data: UTM Coordinate System Zone: zone:16
Polyconic Projection
1983 North American Datum

N

SHEET NUMBER 23 OF 98
FOREST COUNTY, WISCONSIN
ALVIN SW NE QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

FOREST COUNTY, WISCONSIN

ALVIN SE NW QUADRANGLE
SHEET NUMBER 24
3.75 MINUTE SERIES

(Joins sheet 17, Alvin SW)



This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from year 1992 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER

Scale 1:12000

Digital Data: UTM Coordinate System Zone: zone:16
Polyconic Projection
1983 North American Datum

N

SHEET NUMBER 24 OF 98
FOREST COUNTY, WISCONSIN
ALVIN SE NW QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

FOREST COUNTY, WISCONSIN

ALVIN SE NE QUADRANGLE
SHEET NUMBER 25
3.75 MINUTE SERIES

(Joins sheet 18, Alvin SE)



(Joins sheet 24, Alvin SE NW)

(Joins sheet 26, Long Lake NW)

(Joins sheet 32, Alvin SE SE)

This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from year 1992 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER

Scale 1:12000

Digital Data: UTM Coordinate System Zone: zone:16
Polyconic Projection
1983 North American Datum

N

SHEET NUMBER 25 OF 98
FOREST COUNTY, WISCONSIN
ALVIN SE NE QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

FOREST COUNTY, WISCONSIN
LONG LAKE NW QUADRANGLE
SHEET NUMBER 26
3.75 MINUTE SERIES

(Joins sheet 19, Tipler SW)



(Joins sheet 25, Alvin SE NE)

(Joins sheet 27, Long Lake NE)

(Joins sheet 33, Long Lake SW)

This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from year 1992 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER

Scale 1:12000

Digital Data: UTM Coordinate System Zone: zone:16
Polyconic Projection
1983 North American Datum

N

SHEET NUMBER 26 OF 98
FOREST COUNTY, WISCONSIN
LONG LAKE NW QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

FOREST COUNTY, WISCONSIN

LONG LAKE NE QUADRANGLE
SHEET NUMBER 27
3.75 MINUTE SERIES

(Joins sheet 20, Tipler SE)



This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from year 1992 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER

Scale 1:12000

Digital Data: UTM Coordinate System Zone: zone:16
Polyconic Projection
1983 North American Datum

N

SHEET NUMBER 27 OF 98
FOREST COUNTY, WISCONSIN
LONG LAKE NE QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

FOREST COUNTY, WISCONSIN
JULIA LAKE SE QUADRANGLE
SHEET NUMBER 28
3.75 MINUTE SERIES

(Joins sheet 21, Julia Lake NE)



This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from year 1992 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER

Scale 1:12000

Digital Data: UTM Coordinate System Zone: zone:16
Polyconic Projection
1983 North American Datum

N

SHEET NUMBER 28 OF 98
FOREST COUNTY, WISCONSIN
JULIA LAKE SE QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

FOREST COUNTY, WISCONSIN

ALVIN SW SW QUADRANGLE
SHEET NUMBER 29
3.75 MINUTE SERIES

(Joins sheet 22, Alvin SW NW)

89°W
88°58'45"W
R. 12 E.
88°57'30"W
88°56'15"W
45°48'45"N
45°47'30"N
45°46'15"N
45°45'N
T. 38 N.
T. 39 N.

NICOLET NATIONAL FOREST

Pine River

(Joins sheet 28, Julia Lake SE)
(Joins sheet 30 Alvin SW SE)
(Joins sheet 36, Argonne NW)

This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from year 1992 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER

Scale 1:12000

Digital Data: UTM Coordinate System Zone: zone:16
Polyconic Projection
1983 North American Datum

N

SHEET NUMBER 29 OF 98
FOREST COUNTY, WISCONSIN
ALVIN SW SW QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

FOREST COUNTY, WISCONSIN

ALVIN SW SE QUADRANGLE
SHEET NUMBER 30
3.75 MINUTE SERIES



This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from year 1992 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER

Scale 1:12000

Digital Data: UTM Coordinate System Zone: zone:16
Polyconic Projection
1983 North American Datum

N

SHEET NUMBER 30 OF 98
FOREST COUNTY, WISCONSIN
ALVIN SW SE QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

FOREST COUNTY, WISCONSIN

ALVIN SE SW QUADRANGLE
SHEET NUMBER 31
3.75 MINUTE SERIES

(Joins sheet 24, Alvin SE NW)



This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from year 1992 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER

Scale 1:12000

Digital Data: UTM Coordinate System Zone: zone:16
Polyconic Projection
1983 North American Datum

N

SHEET NUMBER 31 OF 98
FOREST COUNTY, WISCONSIN
ALVIN SE SW QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

FOREST COUNTY, WISCONSIN

ALVIN SE SE QUADRANGLE
SHEET NUMBER 32
3.75 MINUTE SERIES

(Joins sheet 25, Alvin SE NE)

88°48'45"W 45°48'45"N — R. 13 E. | R. 14 E. — 88°47'30"W — 88°46'15"W — 88°45'W 45°48'45"N

T. 38 N. | T. 39 N.



45°47'30"N

(Joins sheet 31, Alvin SE SW)

(Joins sheet 33, Long Lake SW)

45°46'15"N

88°48'45"W — R. 13 E. | R. 14 E. — 88°47'30"W — WaC — 88°46'15"W — 88°45'W 45°45'N

(Joins sheet 39, Crandon NE NE)

This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from year 1992 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

1 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 0 1 KILOMETER

Scale 1:12000

Digital Data: UTM Coordinate System Zone: zone:16
Polyconic Projection
1983 North American Datum

N

SHEET NUMBER 32 OF 98
FOREST COUNTY, WISCONSIN
ALVIN SE SE QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

FOREST COUNTY, WISCONSIN
LONG LAKE SW QUADRANGLE
SHEET NUMBER 33
3.75 MINUTE SERIES

(Joins sheet 26, Long Lake NW)

88°45'W
45°48'45"N
88°43'45"W
R. 14 E.
88°42'30"W
88°41'15"W
T. 38 N.
T. 39 N.



45°47'30"N
(Joins sheet 32, Alvin SE SE)
(Joins sheet 34, Long Lake SE)
45°46'15"N
88°45'W
88°43'45"W
R. 14 E.
88°42'30"W
88°41'15"W
45°45'N

(Joins sheet 40, Newald NW)

This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from year 1992 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER

Scale 1:12000

Digital Data: UTM Coordinate System Zone: zone:16
Polyconic Projection
1983 North American Datum

N

SHEET NUMBER 33 OF 98
FOREST COUNTY, WISCONSIN
LONG LAKE SW QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

FOREST COUNTY, WISCONSIN

LONG LAKE SE QUADRANGLE
SHEET NUMBER 34
3.75 MINUTE SERIES

(Joins sheet 27, Long Lake NE)



This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from year 1992 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER

Scale 1:12000

Digital Data: UTM Coordinate System Zone: zone:16
Polyconic Projection
1983 North American Datum

N

SHEET NUMBER 34 OF 98
FOREST COUNTY, WISCONSIN
LONG LAKE SE QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

FOREST COUNTY, WISCONSIN

MONICO NE NE QUADRANGLE
SHEET NUMBER 35
3.75 MINUTE SERIES

(Joins sheet 28, Julia Lake SE)



(Joins sheet 36, Argonne NW)

(Joins sheet 46, Monico NE SE)

This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from year 1992 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER

Scale 1:12000

Digital Data: UTM Coordinate System Zone: zone:16
Polyconic Projection
1983 North American Datum

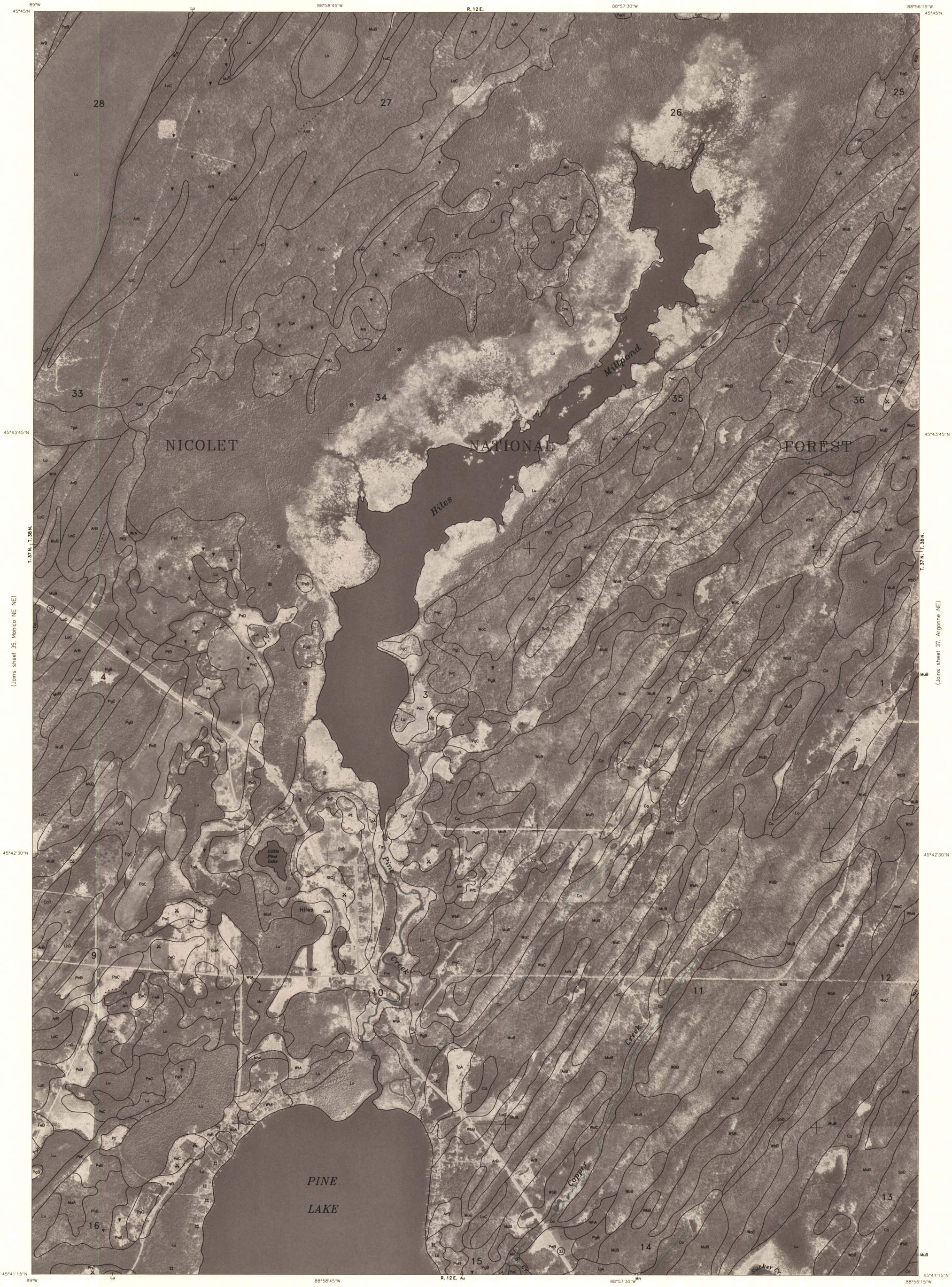
N

SHEET NUMBER 35 OF 98
FOREST COUNTY, WISCONSIN
MONICO NE NE QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

FOREST COUNTY, WISCONSIN
ARGONNE NW QUADRANGLE
SHEET NUMBER 36
3.75 MINUTE SERIES

(Joins sheet 29, Alvin SW SW)



(Joins sheet 35, Monico NE NE)

(Joins sheet 37, Argonne NE)

(Joins sheet 47, Argonne SW)

This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from year 1992 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER

Scale 1:12000

Digital Data: UTM Coordinate System Zone: zone:16
Polyconic Projection
1983 North American Datum

N

SHEET NUMBER 36 OF 98
FOREST COUNTY, WISCONSIN
ARGONNE NW QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

FOREST COUNTY, WISCONSIN

ARGONNE NE QUADRANGLE
SHEET NUMBER 37
3.75 MINUTE SERIES

(Joins sheet 30, Alvin SW SE)



(Joins sheet 36, Argonne NW)
(Joins sheet 38, Crandon NE NW)
(ARGONNE SE)
(Joins sheet 48, Argonne SE)

This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from year 1992 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER

Scale 1:12000

Digital Data: UTM Coordinate System Zone: zone:16
Polyconic Projection
1983 North American Datum

N

SHEET NUMBER 37 OF 98
FOREST COUNTY, WISCONSIN
ARGONNE NE QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

FOREST COUNTY, WISCONSIN

CRANDON NE NW QUADRANGLE
SHEET NUMBER 38
3.75 MINUTE SERIES

(Joins sheet 31, Alvin SE SW)



(Joins sheet 37, Argonne NE)

(Joins sheet 39, Crandon NE NE)

(Joins sheet 49, Crandon NE SW)

This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from year 1992 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER

Scale 1:12000

Digital Data: UTM Coordinate System Zone: zone:16
Polyconic Projection
1983 North American Datum

N

SHEET NUMBER 38 OF 98
FOREST COUNTY, WISCONSIN
CRANDON NE NW QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

FOREST COUNTY, WISCONSIN

CRANDON NE NE QUADRANGLE
SHEET NUMBER 39
3.75 MINUTE SERIES

(Joins sheet 32, Alvin SE SE)

88°48'45"W
45°45'N
R. 13 E. | R. 14 E.
88°47'30"W
88°46'15"W
88°45'W
45°45'N

Popple River
Popple River
Little Popple River
N. Br. P. R.

NICOLET NATIONAL FOREST

25 30 29 28
36 31 32 33
1 6 5 4
12 7 8 9
13 18 17 16

FOREST BOUNDARY

T. 37 N., T. 38 N.

45°43'45"N
45°42'30"N
45°41'15"N

(Joins sheet 38, Crandon NE NW)
(Joins sheet 40, Newald NW)
(Joins sheet 50, Crandon NE SE)

This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from year 1992 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER

Scale 1:12000

Digital Data: UTM Coordinate System Zone: zone:16
Polyconic Projection
1983 North American Datum

N

SHEET NUMBER 39 OF 98
FOREST COUNTY, WISCONSIN
CRANDON NE NE QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

FOREST COUNTY, WISCONSIN

NEWALD NW QUADRANGLE
SHEET NUMBER 40
3.75 MINUTE SERIES

(Joins sheet 33, Long Lake SW)

88°45'W 45°45'N — 88°43'45"W — R. 14 E. — 88°42'30"W — 88°41'15"W 45°45'N

NICOLET NATIONAL FOREST

FOREST BOUNDARY

T. 37 N. | T. 38 N.

45°43'45"N

45°42'30"N

Little Popple River

Marsh No 10

Kersten Creek

Newald

(Joins sheet 39, Crandon NE NE)

(Joins sheet 41, Newald NE)

(Joins sheet 51, Newald SW)

45°41'15"N 88°45'W — 88°43'45"W — R. 14 E. — 88°42'30"W — 45°41'15"N 88°41'15"W

This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from year 1992 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

1 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 0 1 KILOMETER

Scale 1:12000

Digital Data: UTM Coordinate System Zone: zone:16
Polyconic Projection
1983 North American Datum

N

SHEET NUMBER 40 OF 98
FOREST COUNTY, WISCONSIN
NEWALD NW QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

FOREST COUNTY, WISCONSIN

NEWALD NE QUADRANGLE
SHEET NUMBER 41
3.75 MINUTE SERIES

(Joins sheet 34, Long Lake SE)



This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from year 1992 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER

Scale 1:12000

Digital Data: UTM Coordinate System Zone: zone:16
Polyconic Projection
1983 North American Datum

N

SHEET NUMBER 41 OF 98
FOREST COUNTY, WISCONSIN
NEWALD NE QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

FOREST COUNTY, WISCONSIN
LAKE GORDON NW QUADRANGLE
SHEET NUMBER 42
3.75 MINUTE SERIES



This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from year 1992 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER

Scale 1:12000

Digital Data: UTM Coordinate System Zone: zone:16
Polyconic Projection
1983 North American Datum

N

SHEET NUMBER 42 OF 98
FOREST COUNTY, WISCONSIN
LAKE GORDON NW QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

FOREST COUNTY, WISCONSIN
LAKE GORDON NE QUADRANGLE
SHEET NUMBER 43
3.75 MINUTE SERIES



This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from year 1992 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER

Scale 1:12000

Digital Data: UTM Coordinate System Zone: zone:16
Polyconic Projection
1983 North American Datum

N

SHEET NUMBER 43 OF 98
FOREST COUNTY, WISCONSIN
LAKE GORDON NE QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

FOREST COUNTY, WISCONSIN

ARMSTRONG CREEK NW QUADRANGLE
SHEET NUMBER 44
3.75 MINUTE SERIES



This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from year 1992 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER

Scale 1:12000

Digital Data: UTM Coordinate System Zone: zone:16
Polyconic Projection
1983 North American Datum

N

SHEET NUMBER 44 OF 98
FOREST COUNTY, WISCONSIN
ARMSTRONG CREEK NW QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

FOREST COUNTY, WISCONSIN

ARMSTRONG CREEK NE QUADRANGLE
SHEET NUMBER 45
3.75 MINUTE SERIES



This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from year 1992 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER

Scale 1:12000

Digital Data: UTM Coordinate System Zone: zone:16
Polyconic Projection
1983 North American Datum

N

SHEET NUMBER 45 OF 98
FOREST COUNTY, WISCONSIN
ARMSTRONG CREEK NE QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

FOREST COUNTY, WISCONSIN

MONICO NE SE QUADRANGLE
SHEET NUMBER 46
3.75 MINUTE SERIES

(Joins sheet 35, Monico NE NE)



(Joins sheet 47, Argonne SW)

(Joins sheet 57, Nashville NE)

This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from year 1992 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER

Scale 1:12000

Digital Data: UTM Coordinate System Zone: zone:16
Polyconic Projection
1983 North American Datum

N

SHEET NUMBER 46 OF 98
FOREST COUNTY, WISCONSIN
MONICO NE SE QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

FOREST COUNTY, WISCONSIN

ARGONNE SW QUADRANGLE
SHEET NUMBER 47
3.75 MINUTE SERIES

(Joins sheet 36, Argonne NW)



(Joins sheet 46, Monico NE SE)

(Joins sheet 48, Argonne SE)

(Joins sheet 58, Crandon NW)

This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from year 1992 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER

Scale 1:12000

Digital Data: UTM Coordinate System Zone: zone:16
Polyconic Projection
1983 North American Datum

N

SHEET NUMBER 47 OF 98
FOREST COUNTY, WISCONSIN
ARGONNE SW QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

FOREST COUNTY, WISCONSIN

ARGONNE SE QUADRANGLE
SHEET NUMBER 48
3.75 MINUTE SERIES

(Joins sheet 37, Argonne NE)



This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from year 1992 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER

Scale 1:12000

Digital Data: UTM Coordinate System Zone: zone:16
Polyconic Projection
1983 North American Datum

N

SHEET NUMBER 48 OF 98
FOREST COUNTY, WISCONSIN
ARGONNE SE QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

FOREST COUNTY, WISCONSIN

CRANDON NE SW QUADRANGLE
SHEET NUMBER 49
3.75 MINUTE SERIES

(Joins sheet 38, Crandon NE NW)

88°52'30"W 45°41'15"N — 88°51'15"W — R. 13 E. — 88°50'W — 88°48'45"W 45°41'15"N

NICOLET NATIONAL FOREST

FOREST BOUNDARY

ARGONNE

WISCONSIN

CENTRAL LIMITED

Peshtigo River

North Branch Peshtigo River

M. Br. P. R.

South Branch Peshtigo River

45°40'N — 45°38'45"N — 45°37'30"N

(Joins sheet 48, Argonne SE)

(Joins sheet 50, Crandon NE SE)

T. 36 N. | T. 37 N.

(Joins sheet 60, Lake Lucerne NW)

This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from year 1992 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

1 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 0 1 KILOMETER

Scale 1:12000

Digital Data: UTM Coordinate System Zone: zone:16
Polyconic Projection
1983 North American Datum

N

SHEET NUMBER 49 OF 98
FOREST COUNTY, WISCONSIN
CRANDON NE SW QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

FOREST COUNTY, WISCONSIN

CRANDON NE SE QUADRANGLE
SHEET NUMBER 50
3.75 MINUTE SERIES

(Joins sheet 39, Crandon NE NE)



This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from year 1992 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER

Scale 1:12000

Digital Data: UTM Coordinate System Zone: zone:16
Polyconic Projection
1983 North American Datum

N

SHEET NUMBER 50 OF 98
FOREST COUNTY, WISCONSIN
CRANDON NE SE QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

FOREST COUNTY, WISCONSIN

NEWALD SW QUADRANGLE
SHEET NUMBER 51
3.75 MINUTE SERIES

(Joins sheet 40, Newald NW)

88°45'W
45°41'15"N
88°43'45"W
R. 14 E.
88°42'30"W
88°41'15"W
45°41'15"N
45°40'N
45°38'45"N
45°37'30"N

(Joins sheet 50, Crandon NE, SE)

(Joins sheet 52, Newald SE)

T. 37 N.
T. 36 N.

Peshbigo
M. No 10 Cr.
Rader
Creek
Otter
Eight
Scarlytwo
Camp
Cr.

NICOLET NATIONAL FOREST
FOREST BOUNDARY
WISCONSIN
CENTRAL

(Joins sheet 62, Laona NW)

This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from year 1992 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER

Scale 1:12000

Digital Data: UTM Coordinate System Zone: zone:16
Polyconic Projection
1983 North American Datum

N

SHEET NUMBER 51 OF 98
FOREST COUNTY, WISCONSIN
NEWALD SW QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

FOREST COUNTY, WISCONSIN

NEWALD SE QUADRANGLE
SHEET NUMBER 52
3.75 MINUTE SERIES

(Joins sheet 41, Newald NE)

88°41'15"W 45°41'15"N — R. 14 E. | R. 15 E. — 88°40'W — 88°38'45"W — 88°37'30"W 45°41'15"N

45°40'N

(Joins sheet 51, Newald SW)

(Joins sheet 53, Lake Gordon SW)

45°38'45"N

T. 37 N.
T. 36 N.

45°37'30"N — R. 14 E. | R. 15 E. — 88°40'W — 88°38'45"W — 45°37'30"N 88°37'30"W

(Joins sheet 63, Laona NE)

This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from year 1992 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

1 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 0 1 KILOMETER

Scale 1:12000

Digital Data: UTM Coordinate System Zone: zone:16
Polyconic Projection
1983 North American Datum

N

SHEET NUMBER 52 OF 98
FOREST COUNTY, WISCONSIN
NEWALD SE QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

FOREST COUNTY, WISCONSIN

LAKE GORDON SW QUADRANGLE
SHEET NUMBER 53
3.75 MINUTE SERIES

(Joins sheet 42, Lake Gordon NW)

88°37'30"W 88°36'15"W R. 15E 88°35'W 88°33'45"W

45°41'15"N

45°40'N

45°38'45"N

45°37'30"N

T. 36 N. T. 37 N.

(Joins sheet 52, Newald SE)

(Joins sheet 54, Lake Gordon SE)

NICOLET NATIONAL FOREST

Bull Creek
Peshtigo River
Whiting Creek
Haymeadow Creek
Logger Lake
Cavour Pond
Camp Three Lake

(Joins sheet 64, Blackwell NW)

This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from year 1992 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

1 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 0 1 KILOMETER

Scale 1:12000

Digital Data: UTM Coordinate System Zone: zone:16
Polyconic Projection
1983 North American Datum

N

SHEET NUMBER 53 OF 98
FOREST COUNTY, WISCONSIN
LAKE GORDON SW QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

FOREST COUNTY, WISCONSIN

LAKE GORDON SE QUADRANGLE
SHEET NUMBER 54
3.75 MINUTE SERIES

(Joins sheet 43, Lake Gordon NE)

88°33'45"W
45°41'15"N
R. 15 E. | R. 16 E.
88°32'30"W
88°31'15"W
88°30'W
45°41'15"N

Rat Lake
Logger Lake
Armstrong Creek
Catwillow Creek
WISCONSIN CENTRAL
NICOLET NATIONAL FOREST

45°40'N

(Joins sheet 53, Lake Gordon SW)

(Joins sheet 55, Armstrong Creek SW)

45°38'45"N

T. 36 N. | T. 37 N.

45°37'30"N
88°33'45"W
R. 15 E. | R. 16 E.
88°32'30"W
88°31'15"W
88°30'W
45°37'30"N

(Joins sheet 65, Blackwell NE)

This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from year 1992 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER

Scale 1:12000

Digital Data: UTM Coordinate System Zone: zone:16
Polyconic Projection
1983 North American Datum

N

SHEET NUMBER 54 OF 98
FOREST COUNTY, WISCONSIN
LAKE GORDON SE QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

FOREST COUNTY, WISCONSIN

ARMSTRONG CREEK SW QUADRANGLE
SHEET NUMBER 55
3.75 MINUTE SERIES

(Joins sheet 44, Armstrong Creek NW)



(Joins sheet 54, Lake Gordon SE)

(Joins sheet 56, Armstrong Creek SE)

(Joins sheet 66, Goodman SW NW)

This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from year 1992 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER

Scale 1:12000

Digital Data: UTM Coordinate System Zone: zone:16
Polyconic Projection
1983 North American Datum

N

SHEET NUMBER 55 OF 98
FOREST COUNTY, WISCONSIN
ARMSTRONG CREEK SW QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

FOREST COUNTY, WISCONSIN

ARMSTRONG CREEK SE QUADRANGLE
SHEET NUMBER 56
3.75 MINUTE SERIES

(Joins sheet 45, Armstrong Creek NE)

88°26'15"W — 88°25'W — 88°23'45"W — 88°22'30"W
45°41'15"N — 45°40'N — 45°38'45"N — 45°37'30"N

R. 16 E. | R. 17 E.



T. 36 N. | T. 37 N.

(Joins sheet 55, Armstrong Creek SW)

(Joins sheet 67, Goodman SW NE)

This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from year 1992 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER

Scale 1:12000

Digital Data: UTM Coordinate System Zone: zone:16
Polyconic Projection
1983 North American Datum

N

SHEET NUMBER 56 OF 98
FOREST COUNTY, WISCONSIN
ARMSTRONG CREEK SE QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

FOREST COUNTY, WISCONSIN
NASHVILLE NE QUADRANGLE
SHEET NUMBER 57
3.75 MINUTE SERIES

(Joins sheet 46, Monico NE SE)



This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from year 1992 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER

Scale 1:12000

Digital Data: UTM Coordinate System Zone: zone:16
Polyconic Projection
1983 North American Datum

N

SHEET NUMBER 57 OF 98
FOREST COUNTY, WISCONSIN
NASHVILLE NE QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

FOREST COUNTY, WISCONSIN
CRANDON NW QUADRANGLE
SHEET NUMBER 58
3.75 MINUTE SERIES

(Joins sheet 47, Argonne SW)



(Joins sheet 57, Nashville NE)
(Joins sheet 59, Crandon NE)
(Joins sheet 69, Crandon SW)

This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from year 1992 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER

Scale 1:12000

Digital Data: UTM Coordinate System Zone: zone:16
Polyconic Projection
1983 North American Datum

N

SHEET NUMBER 58 OF 98
FOREST COUNTY, WISCONSIN
CRANDON NW QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

FOREST COUNTY, WISCONSIN
CRANDON NE QUADRANGLE
SHEET NUMBER 59
3.75 MINUTE SERIES

(Joins sheet 48, Argonne SE)

88°56'15"W 45°37'30"N — R. 12 E. | R. 13 E. — 88°55'W — 88°53'45"W — 88°52'30"W 45°37'30"N

45°36'15"N

45°35'N

T. 36 N.

(Joins sheet 58, Crandon NW)

(Joins sheet 60, Lake Lucerne NW)

Drake Creek
South Branch Peshtigo River
Peshtigo Lake
Clear Lake
Surprise Lake
Crandon

88°56'15"W 45°33'45"N — R. 12 E. | R. 13 E. — 88°55'W — 88°53'45"W — 88°52'30"W 45°33'45"N

(Joins sheet 70, Crandon SE)

This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from year 1992 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER

Scale 1:12000

Digital Data: UTM Coordinate System Zone: zone:16
Polyconic Projection
1983 North American Datum

N

SHEET NUMBER 59 OF 98
FOREST COUNTY, WISCONSIN
CRANDON NE QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

FOREST COUNTY, WISCONSIN

LAKE LUCERNE NW QUADRANGLE
SHEET NUMBER 60
3.75 MINUTE SERIES

(Joins sheet 49, Crandon NE SW)



(Joins sheet 59, Crandon NE)

(Joins sheet 61, Lake Lucerne NE)

(Joins sheet 71, Lake Lucerne SW)

This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from year 1992 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER

Scale 1:12000

Digital Data: UTM Coordinate System Zone: zone:16
Polyconic Projection
1983 North American Datum

N

SHEET NUMBER 60 OF 98
FOREST COUNTY, WISCONSIN
LAKE LUCERNE NW QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

FOREST COUNTY, WISCONSIN
LAKE LUCERNE NE QUADRANGLE
SHEET NUMBER 61
3.75 MINUTE SERIES

(Joins sheet 50, Crandon NE, SE)



This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from year 1992 aerial photography. Coordinate grid ticks and land division corners, if shown, cre approximately positioned. Digital soils data is available for this quadrangle.

1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER

Scale 1:12000

Digital Data: UTM Coordinate System Zone: zone:16
Polyconic Projection
1983 North American Datum

N

SHEET NUMBER 61 OF 98
FOREST COUNTY, WISCONSIN
LAKE LUCERNE NE QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

FOREST COUNTY, WISCONSIN

LAONA NW QUADRANGLE
SHEET NUMBER 62
3.75 MINUTE SERIES

(Joins sheet 51, Newald SW)



(Joins sheet 61, Lake Lucerne NE)

(Joins sheet 63, Laona NE)

(Joins sheet 73, Laona SW)

This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from year 1992 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER

Scale 1:12000

Digital Data: UTM Coordinate System Zone: zone:16
Polyconic Projection
1983 North American Datum

N

SHEET NUMBER 62 OF 98
FOREST COUNTY, WISCONSIN
LAONA NW QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

FOREST COUNTY, WISCONSIN
LAONA NE QUADRANGLE
SHEET NUMBER 63
3.75 MINUTE SERIES

(Joins sheet 52, Newald SE)



This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from year 1992 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER

Scale 1:12000

Digital Data: UTM Coordinate System Zone: zone:16
Polyconic Projection
1983 North American Datum

N

SHEET NUMBER 63 OF 98
FOREST COUNTY, WISCONSIN
LAONA NE QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

FOREST COUNTY, WISCONSIN

BLACKWELL NW QUADRANGLE
SHEET NUMBER 64
3.75 MINUTE SERIES

(Joins sheet 53, Lake Gordon SW)



This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from year 1992 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER

Scale 1:12000

Digital Data: UTM Coordinate System Zone: zone:16
Polyconic Projection
1983 North American Datum

N

SHEET NUMBER 64 OF 98
FOREST COUNTY, WISCONSIN
BLACKWELL NW QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

FOREST COUNTY, WISCONSIN

BLACKWELL NE QUADRANGLE
SHEET NUMBER 65
3.75 MINUTE SERIES

(Joins sheet 54, Lake Gordon SE)



(Joins sheet 64, Blackwell NW)

(Joins sheet 66, Goodman SW NW)

(Joins sheet 76, Blackwell SE)

This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from year 1992 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

1 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 0 1 KILOMETER

Scale 1:12000

Digital Data: UTM Coordinate System Zone: zone:16
Polyconic Projection
1983 North American Datum

N

SHEET NUMBER 65 OF 98
FOREST COUNTY, WISCONSIN
BLACKWELL NE QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

FOREST COUNTY, WISCONSIN

GOODMAN SW NW QUADRANGLE
SHEET NUMBER 66
3.75 MINUTE SERIES

(Joins sheet 55, Armstrong Creek SW)

88°30'W 88°28'45"W R. 16 E. 88°27'30"W 88°26'15"W
45°37'30"N 45°37'30"N



45°36'15"N 45°36'15"N

(Joins sheet 65, Blackwell NE)

T. 36 N.

(Joins sheet 67, Goodman SW NE)

T. 36 N.

45°35'N 45°35'N

45°33'45"N 45°33'45"N
88°30'W 88°28'45"W R. 16 E. 88°27'30"W 88°26'15"W

(Joins sheet 77, Goodman SW SW)

This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from year 1992 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER

Scale 1:12000

Digital Data: UTM Coordinate System Zone: zone:16
Polyconic Projection
1983 North American Datum

N

SHEET NUMBER 66 OF 98
FOREST COUNTY, WISCONSIN
GOODMAN SW NW QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

FOREST COUNTY, WISCONSIN

GOODMAN SW NE QUADRANGLE
SHEET NUMBER 67
3.75 MINUTE SERIES

(Joins sheet 56, Armstrong Creek SE)



(Joins sheet 66, Goodman SW NW)

(Joins sheet 78, Goodman SW SE)

This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from year 1992 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER

Scale 1:12000

Digital Data: UTM Coordinate System Zone: zone:16
Polyconic Projection
1983 North American Datum

N

SHEET NUMBER 67 OF 98
FOREST COUNTY, WISCONSIN
GOODMAN SW NE QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

FOREST COUNTY, WISCONSIN

NASHVILLE SE QUADRANGLE
SHEET NUMBER 68
3.75 MINUTE SERIES

(Joins sheet 57, Nashville NE)



(Joins sheet 69, Crandon SW)

(Joins sheet 79, Post Lake NE)

This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from year 1992 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER

Scale 1:12000

Digital Data: UTM Coordinate System Zone: zone:16
Polyconic Projection
1983 North American Datum

N

SHEET NUMBER 68 OF 98
FOREST COUNTY, WISCONSIN
NASHVILLE SE QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

FOREST COUNTY, WISCONSIN

CRANDON SW QUADRANGLE
SHEET NUMBER 69
3.75 MINUTE SERIES

(Joins sheet 58, Crandon NW)

89°W | 88°58'45"W | R. 12 E. | 88°57'30"W | 88°56'15"W

45°33'45"N

T. 35 N. | T. 36 N.

45°32'30"N

(Joins sheet 68, Nashville SE)

(Joins sheet 70, Crandon SE)

45°31'15"N

45°30'N

Rice Lake

Ghske Creek

(Joins sheet 80, Mole Lake NW)

This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from year 1992 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

1 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 0 1 KILOMETER

Scale 1:12000

Digital Data: UTM Coordinate System Zone: zone:16
Polyconic Projection
1983 North American Datum

N

SHEET NUMBER 69 OF 98
FOREST COUNTY, WISCONSIN
CRANDON SW QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

FOREST COUNTY, WISCONSIN

CRANDON SE QUADRANGLE
SHEET NUMBER 70
3.75 MINUTE SERIES

(Joins sheet 59, Crandon NE)



(Joins sheet 69, Crandon SW)

(Joins sheet 71, Lake Lucerne SW)

(Joins sheet 81, Mole Lake NE)

This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from year 1992 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER

Scale 1:12000

Digital Data: UTM Coordinate System Zone: zone:16
Polyconic Projection
1983 North American Datum

N

SHEET NUMBER 70 OF 98
FOREST COUNTY, WISCONSIN
CRANDON SE QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

FOREST COUNTY, WISCONSIN

LAKE LUCERNE SW QUADRANGLE
SHEET NUMBER 71
3.75 MINUTE SERIES

(Joins sheet 60, Lake Lucerne NW)

88°52'30"W 45°33'45"N — 88°51'15"W — R. 13 E. — 88°50'W — 88°48'45"W 45°33'45"N

45°32'30"N

45°31'15"N

45°30'N 88°52'30"W — 88°51'15"W — R. 13 E. — 88°50'W — 88°48'45"W 45°30'N

T. 35 N. | T. 36 N.

(Joins sheet 70, Crandon SE)

(Joins sheet 72, Lake Lucerne SE)

(Joins sheet 82, Roberts Lake NW)

This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from year 1992 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

1 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 0 1 KILOMETER

Scale 1:12000

Digital Data: UTM Coordinate System Zone: zone:16
Polyconic Projection
1983 North American Datum

N

SHEET NUMBER 71 OF 98
FOREST COUNTY, WISCONSIN
LAKE LUCERNE SW QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

FOREST COUNTY, WISCONSIN

LAKE LUCERNE SE QUADRANGLE
SHEET NUMBER 72
3.75 MINUTE SERIES

(Joins sheet 61, Lake Lucerne NE)



(Joins sheet 71, Lake Lucerne SW)

(Joins sheet 73, Laona SW)

(Joins sheet 83, Roberts Lake NE)

This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from year 1992 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER

Scale 1:12000

Digital Data: UTM Coordinate System Zone: zone:16
Polyconic Projection
1983 North American Datum

N

SHEET NUMBER 72 OF 98
FOREST COUNTY, WISCONSIN
LAKE LUCERNE SE QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

FOREST COUNTY, WISCONSIN

LAONA SW QUADRANGLE
SHEET NUMBER 73
3.75 MINUTE SERIES

(Joins sheet 62, Laona NW)

88°45'W
45°33'45"N
88°43'45"W
R. 14 E.
88°42'30"W
88°41'15"W
45°33'45"N

Rat River
Silver Lake
Honey Creek
Stanson Creek
NICOLET NATIONAL FOREST

T. 35 N. | T. 36 N.

45°32'30"N

(Joins sheet 72, Lake Lucerne SE)

(Joins sheet 74, Laona SE)

45°31'15"N

45°30'N
88°45'W
88°43'45"W
R. 14 E.
88°42'30"W
88°41'15"W

(Joins sheet 84, Wabeno NW)

This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from year 1992 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER

Scale 1:12000

Digital Data: UTM Coordinate System Zone: zone:16
Polyconic Projection
1983 North American Datum

N

SHEET NUMBER 73 OF 98
FOREST COUNTY, WISCONSIN
LAONA SW QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

FOREST COUNTY, WISCONSIN

LAONA SE QUADRANGLE
SHEET NUMBER 74
3.75 MINUTE SERIES

(Joins sheet 63, Laona NE)



(Joins sheet 73, Laona SW)
(Joins sheet 75, Blackwell SW)
(Joins sheet 85, Wabeno NE)

This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from year 1992 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER

Scale 1:12000

Digital Data: UTM Coordinate System Zone: zone:16
Polyconic Projection
1983 North American Datum

N

SHEET NUMBER 74 OF 98
FOREST COUNTY, WISCONSIN
LAONA SE QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

FOREST COUNTY, WISCONSIN

BLACKWELL SW QUADRANGLE
SHEET NUMBER 75
3.75 MINUTE SERIES

(Joins sheet 64, Blackwell NW)

88°37'30"W 45°33'45"N — 88°36'15"W — R. 15 E. — 88°35'W — 88°33'45"W 45°33'45"N

T. 35 N. | T. 36 N.

45°32'30"N

45°31'15"N

(Joins sheet 74, Laona SE)

(Joins sheet 76, Blackwell SE)

NICOLET NATIONAL FOREST

Stoney Creek

Shabodook Lake

Shabodook Creek

Rat River

Spencer Creek

Kufner Creek

Blackwell

Blackwell Job Corps Center

33 34 35 36 4 3 2 1 9 10 11 12 16 15 14 13 21 22 23 24

45°30'N 88°37'30"W — 88°36'15"W — R. 15 E. — 88°35'W — 88°33'45"W 45°30'N

(Joins sheet 86, Otter Lake NW)

This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from year 1992 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

1 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 0 1 KILOMETER

Scale 1:12000

Digital Data: UTM Coordinate System Zone: zone:16
Polyconic Projection
1983 North American Datum

N

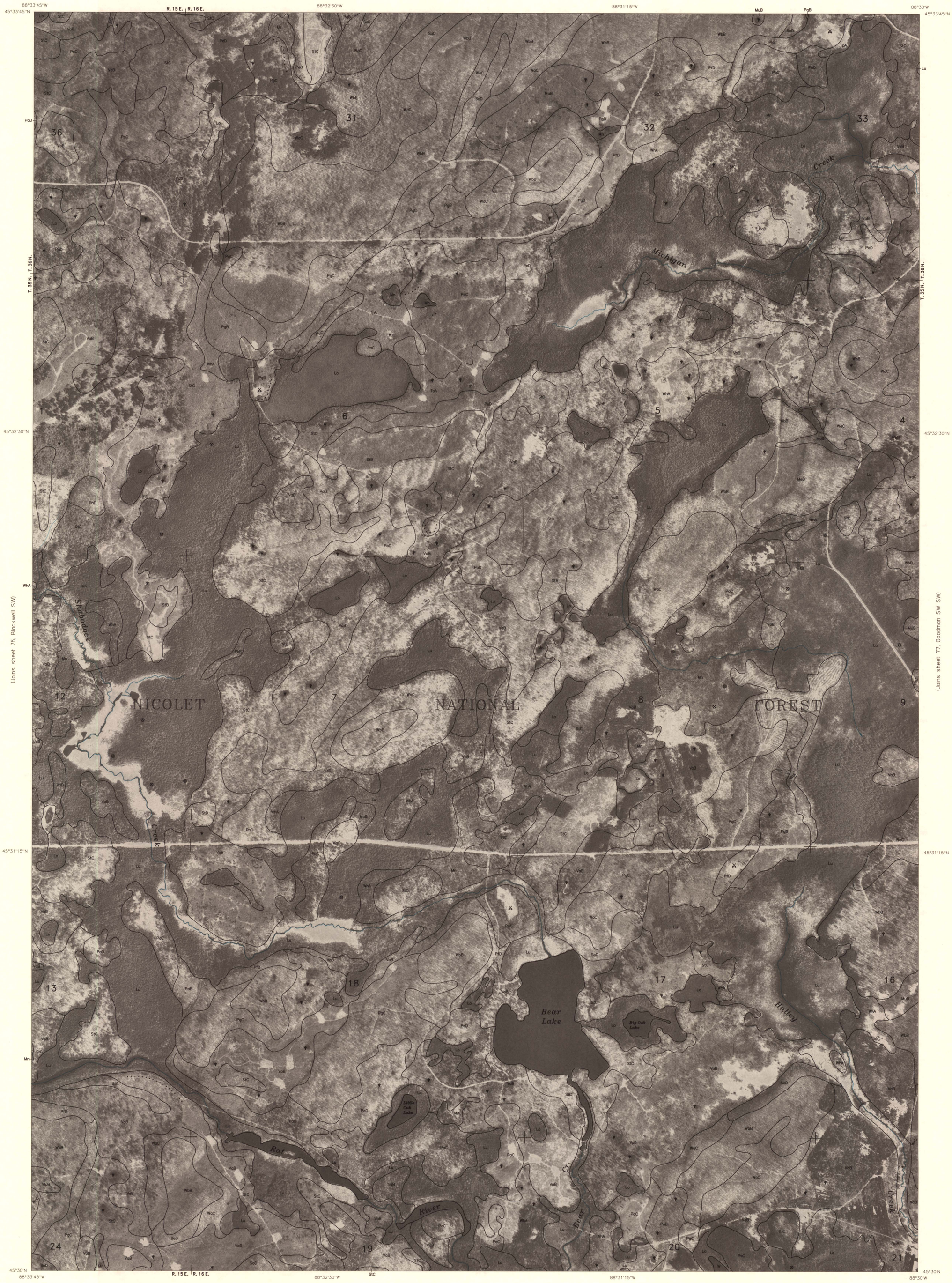
SHEET NUMBER 75 OF 98
FOREST COUNTY, WISCONSIN
BLACKWELL SW QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

FOREST COUNTY, WISCONSIN

BLACKWELL SE QUADRANGLE
SHEET NUMBER 76
3.75 MINUTE SERIES

(Joins sheet 65, Blackwell NE)



This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from year 1992 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER

Scale 1:12000

Digital Data: UTM Coordinate System Zone: zone:16
Polyconic Projection
1983 North American Datum

N

SHEET NUMBER 76 OF 98
FOREST COUNTY, WISCONSIN
BLACKWELL SE QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

FOREST COUNTY, WISCONSIN

GOODMAN SW SW QUADRANGLE
SHEET NUMBER 77
3.75 MINUTE SERIES

(Joins sheet 66, Goodman SW NW)



(Joins sheet 76, Blackwell SE)

(Joins sheet 78, Goodman SW SE)

(Joins sheet 88, McCaslin Mountain NW)

This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from year 1992 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER

Scale 1:12000

Digital Data: UTM Coordinate System Zone: zone:16
Polyconic Projection
1983 North American Datum

N

SHEET NUMBER 77 OF 98
FOREST COUNTY, WISCONSIN
GOODMAN SW SW QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

FOREST COUNTY, WISCONSIN

GOODMAN SW SE QUADRANGLE
SHEET NUMBER 78
3.75 MINUTE SERIES

(Joins sheet 67, Goodman SW NE)

88°26'15"W
45°33'45"N
R. 16 E. | R. 17 E.
88°25'W
88°23'45"W
88°22'30"W
45°33'45"N

T. 35 N. | T. 36 N.

45°32'30"N

NICOLET NATIONAL FOREST
MARINETTE COUNTY

Peshtigo River

45°31'15"N

45°30'N
88°26'15"W
R. 16 E. | R. 17 E.
88°25'W
88°23'45"W
88°22'30"W
45°30'N

(Joins sheet 77, Goodman SW SW)

(Joins sheet 89, McCaslin Mountain NE)

This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from year 1993 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER

Scale 1:12000

Digital Data: UTM Coordinate System Zone: zone:16
Polyconic Projection
1983 North American Datum

N

SHEET NUMBER 78 OF 98
FOREST COUNTY, WISCONSIN
GOODMAN SW SE QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

FOREST COUNTY, WISCONSIN
POST LAKE NE QUADRANGLE
SHEET NUMBER 79
3.75 MINUTE SERIES

(Joins sheet 68, Nashville SE)

89°3'45"W
45°30'N
R. 11 E. | R. 12 E.
89°2'30"W
89°1'15"W
89°W
45°30'N



45°28'45"N
45°27'30"N
45°26'15"N
89°3'45"W
R. 11 E. | R. 12 E.
89°2'30"W
89°1'15"W
89°W
45°26'15"N

(Joins sheet 80, Mole Lake NW)

This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from year 1992 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER

Scale 1:12000

Digital Data: UTM Coordinate System Zone: zone:16
Polyconic Projection
1983 North American Datum

N

SHEET NUMBER 79 OF 98
FOREST COUNTY, WISCONSIN
POST LAKE NE QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

FOREST COUNTY, WISCONSIN

MOLE LAKE NW QUADRANGLE
SHEET NUMBER 80
3.75 MINUTE SERIES

(Joins sheet 69, Crandon SW)

89°W
45°30'N
88°58'45"W
R. 12 E.
88°57'30"W
88°56'15"W
45°30'N



45°28'45"N
45°27'30"N
45°26'15"N

(Joins sheet 79, Post Lake NE)
(Joins sheet 81, Mole Lake NE)

89°W
88°58'45"W
R. 12 E.
88°57'30"W
88°56'15"W

This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from year 1992 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER

Scale 1:12000

Digital Data: UTM Coordinate System Zone: zone:16
Polyconic Projection
1983 North American Datum

N

SHEET NUMBER 80 OF 98
FOREST COUNTY, WISCONSIN
MOLE LAKE NW QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

FOREST COUNTY, WISCONSIN

MOLE LAKE NE QUADRANGLE
SHEET NUMBER 81
3.75 MINUTE SERIES

(Joins sheet 70, Crandon SE)



(Joins sheet 80, Mole Lake NW)

(Joins sheet 82, Roberts Lake NW)

(Joins sheet 90, Mole Lake SE)

This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from year 1992 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER

Scale 1:12000

Digital Data: UTM Coordinate System Zone: zone:16
Polyconic Projection
1983 North American Datum

N

SHEET NUMBER 81 OF 98
FOREST COUNTY, WISCONSIN
MOLE LAKE NE QUADRANGLE

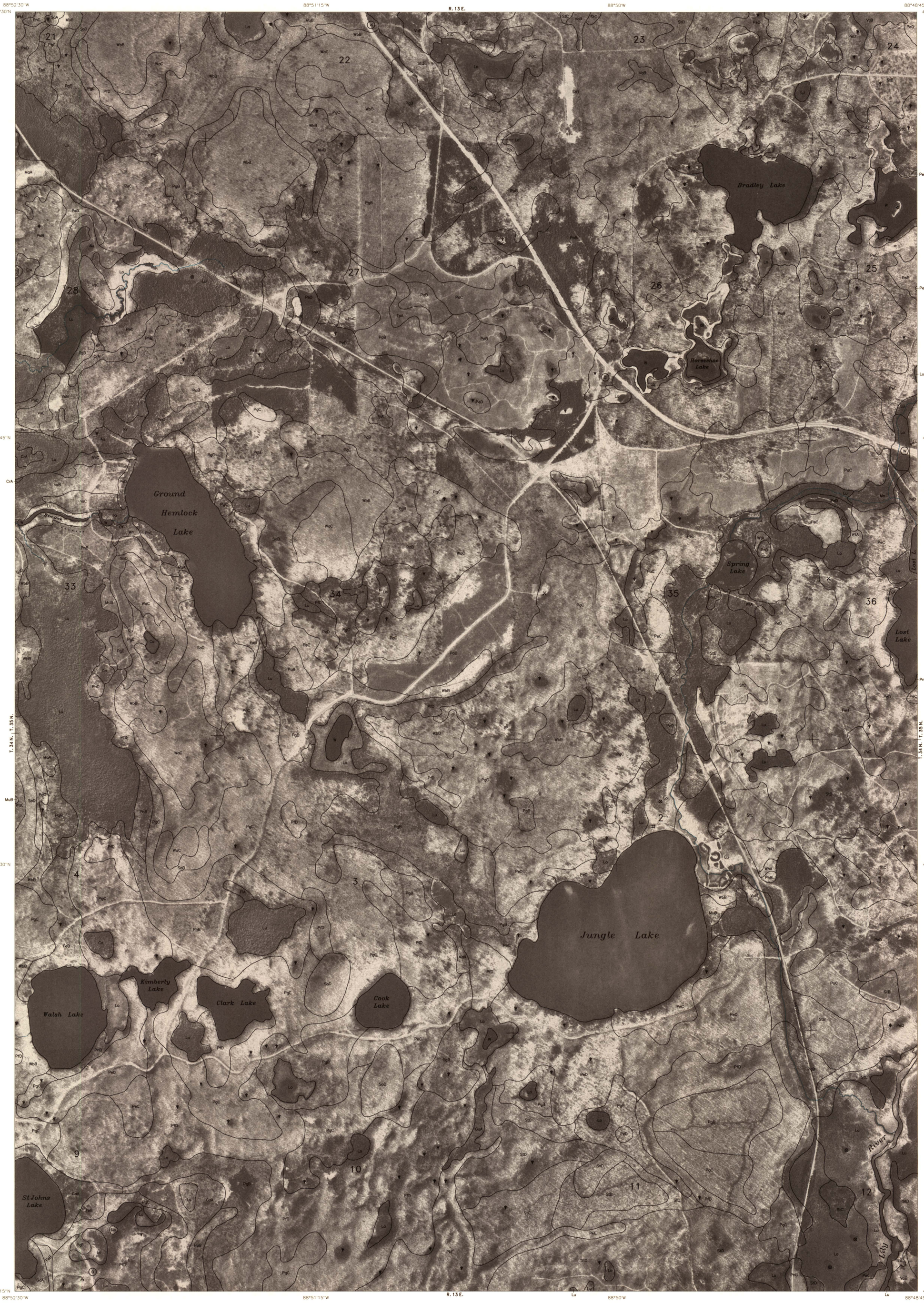
UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

FOREST COUNTY, WISCONSIN

ROBERTS LAKE NW QUADRANGLE
SHEET NUMBER 82
3.75 MINUTE SERIES

(Joins sheet 71, Lake Lucerne SW)

88°52'30"W 88°51'15"W R. 13 E. 88°50'W 88°48'45"W
45°30'N 45°30'N



45°28'45"N 45°28'45"N
45°27'30"N 45°27'30"N
45°26'15"N 45°26'15"N

88°52'30"W 88°51'15"W R. 13 E. 88°50'W 88°48'45"W

(Joins sheet 81, Mole Lake NE)
(Joins sheet 83, Roberts Lake NE)
T. 34 N. | T. 35 N.
(Joins sheet 91, Roberts Lake SW)

This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from year 1992 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER

Scale 1:12000

Digital Data: UTM Coordinate System Zone: zone:16
Polyconic Projection
1983 North American Datum

N

SHEET NUMBER 82 OF 98
FOREST COUNTY, WISCONSIN
ROBERTS LAKE NW QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

FOREST COUNTY, WISCONSIN

ROBERTS LAKE NE QUADRANGLE
SHEET NUMBER 83
3.75 MINUTE SERIES

(Joins sheet 72, Lake Lucerne SE)



This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from year 1992 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER

Scale 1:12000

Digital Data: UTM Coordinate System Zone: zone:16
Polyconic Projection
1983 North American Datum

N

SHEET NUMBER 83 OF 98
FOREST COUNTY, WISCONSIN
ROBERTS LAKE NE QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

FOREST COUNTY, WISCONSIN

WABENO NW QUADRANGLE
SHEET NUMBER 84
3.75 MINUTE SERIES

(Joins sheet 73, Laona SW)

88°45'W 45°30'N — 88°43'45"W — 88°42'30"W — 88°41'15"W 45°30'N

R. 14 E.

NICOLET NATIONAL FOREST

Finnerty Lake
Brandt Lake
North Branch Oconto River
Himley Lake
Bass Lake
Spring Lake
Richardson Lake
Zarling Lake
Richardson Creek

45°28'45"N

45°27'30"N

45°26'15"N

(Joins sheet 83, Roberts Lake NE)

(Joins sheet 85, Wabeno NE)

T. 34 N. | T. 35 N.

(Joins sheet 93, Wabeno SW)

This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from year 1992 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

1 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 0 1 KILOMETER

Scale 1:12000

Digital Data: UTM Coordinate System Zone: zone:16
Polyconic Projection
1983 North American Datum

N

SHEET NUMBER 84 OF 98
FOREST COUNTY, WISCONSIN
WABENO NW QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

FOREST COUNTY, WISCONSIN

WABENO NE QUADRANGLE
SHEET NUMBER 85
3.75 MINUTE SERIES

(Joins sheet 74, Laona SE)



This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from year 1992 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER

Scale 1:12000

Digital Data: UTM Coordinate System Zone: zone:16
Polyconic Projection
1983 North American Datum

N

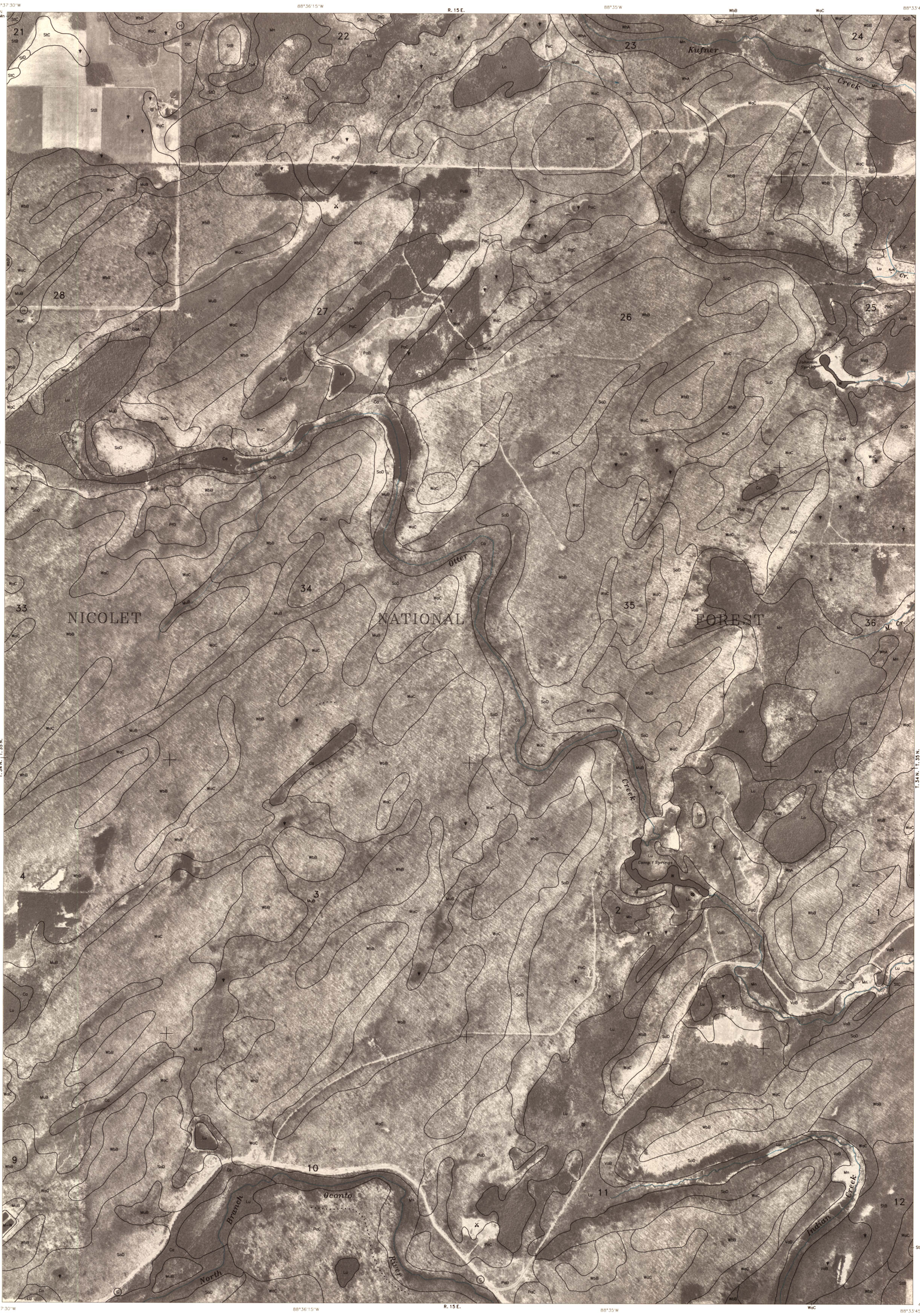
SHEET NUMBER 85 OF 98
FOREST COUNTY, WISCONSIN
WABENO NE QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

FOREST COUNTY, WISCONSIN
OTTER LAKE NW QUADRANGLE
SHEET NUMBER 86
3.75 MINUTE SERIES

(Joins sheet 75, Blackwell SW)

88°37'30"W
45°30'N
88°36'15"W
R. 15 E.
88°35'W
88°33'45"W
45°30'N



45°28'45"N
(Joins sheet 85, Wabeno NE)
45°28'45"N
(Joins sheet 87, Otter Lake NE)
T. 34 N., T. 35 N.
T. 34 N., T. 35 N.
45°27'30"N
45°27'30"N
45°26'15"N
88°37'30"W
88°36'15"W
R. 15 E.
88°35'W
88°33'45"W
45°26'15"N

(Joins sheet 95, Otter Lake SW)

This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Bcse maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from year 1992 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER

Scale 1:12000

Digital Data: UTM Coordinate System Zone: zone:16
Polyconic Projection
1983 North American Datum

N

SHEET NUMBER 86 OF 98
FOREST COUNTY, WISCONSIN
OTTER LAKE NW QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

FOREST COUNTY, WISCONSIN

OTTER LAKE NE QUADRANGLE
SHEET NUMBER 87
3.75 MINUTE SERIES

(Joins sheet 76, Blackwell SE)



(Joins sheet 86, Otter Lake NW)

(Joins sheet 88, Mc Caslin Mountain NW)

(Joins sheet 96, Otter Lake SE)

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1 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 0 1 KILOMETER

Scale 1:12000

Digital Data: UTM Coordinate System Zone: zone:16
Polyconic Projection
1983 North American Datum

N

SHEET NUMBER 87 OF 98
FOREST COUNTY, WISCONSIN
OTTER LAKE NE QUADRANGLE

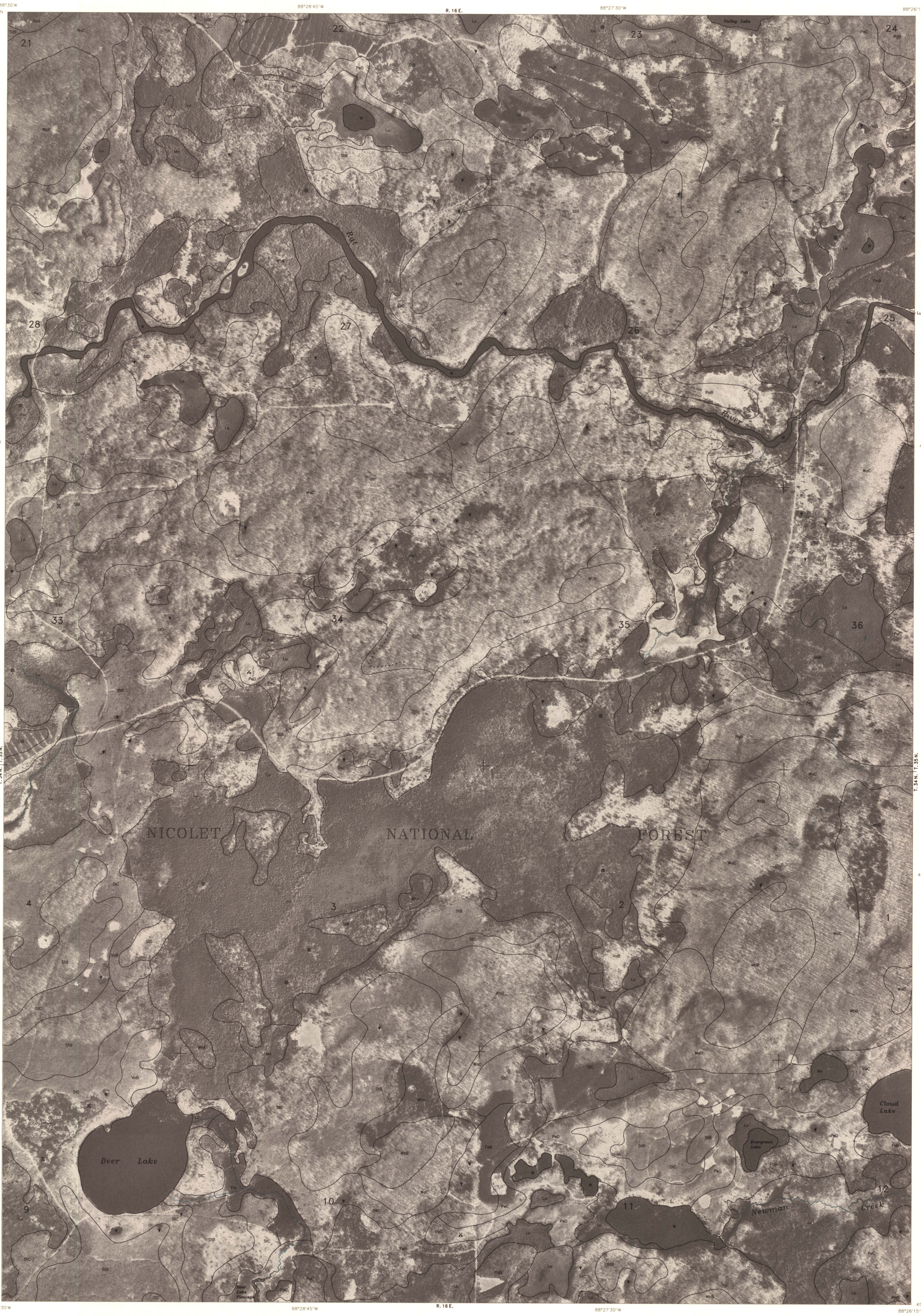
UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

FOREST COUNTY, WISCONSIN

MC CASLIN MOUNTAIN NW QUADRANGLE
SHEET NUMBER 88
3.75 MINUTE SERIES

(Joins sheet 77, Goodman SW SW)

88°30'W
45°30'N
88°28'45"W
R. 16 E.
88°27'30"W
88°26'15"W
45°30'N



45°28'45"N
45°27'30"N
45°26'15"N

(Joins sheet 87, Otter Lake NE)
(Joins sheet 89, Mc Caslin Mountain NE)

T. 34 N. | T. 35 N.

88°30'W
88°28'45"W
R. 16 E.
88°27'30"W
88°26'15"W

(Joins sheet 97, Mc Caslin Mountain SW)

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1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER

Scale 1:12000

Digital Data: UTM Coordinate System Zone: zone:16
Polyconic Projection
1983 North American Datum

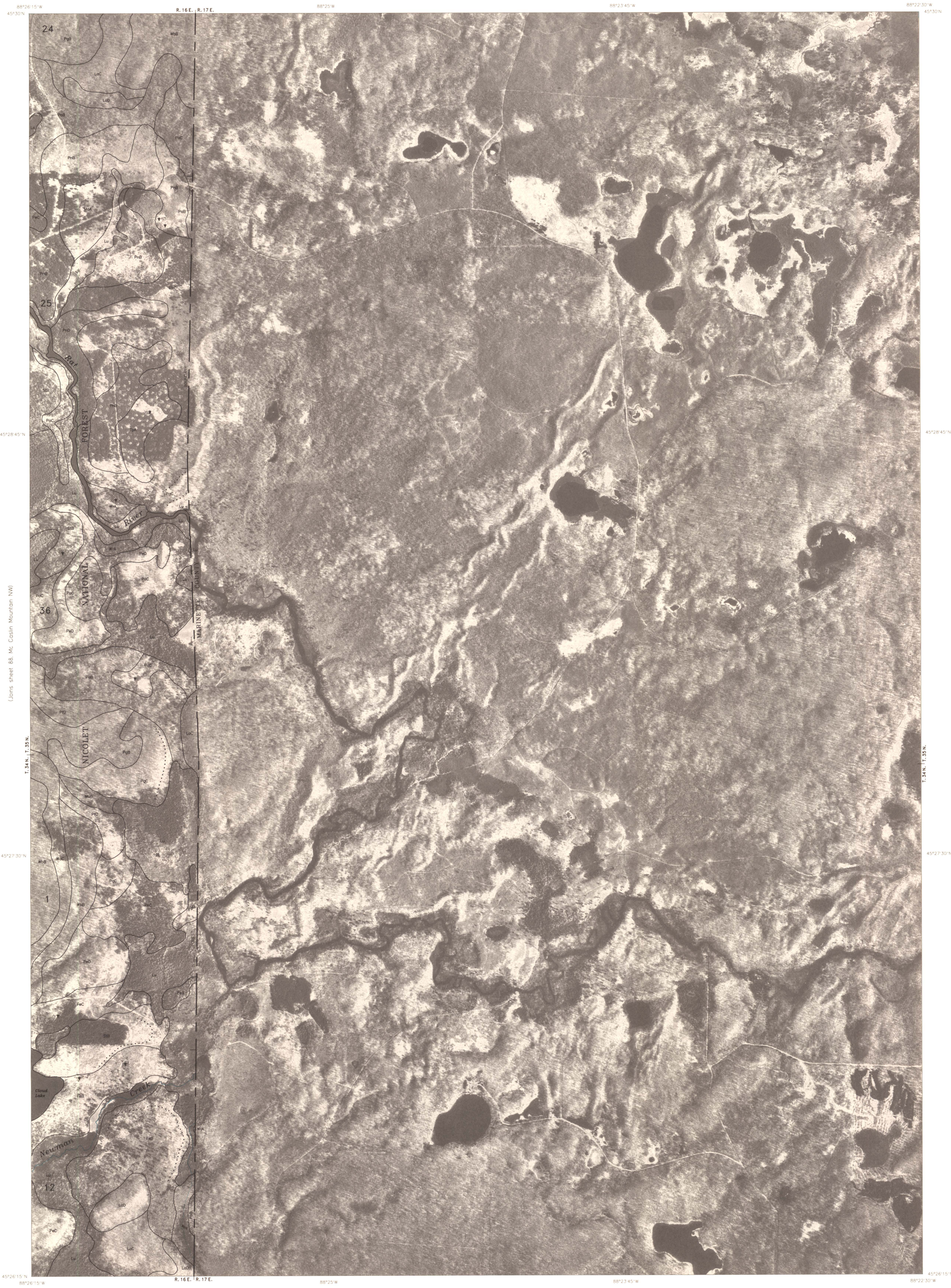
N

SHEET NUMBER 88 OF 98
FOREST COUNTY, WISCONSIN
MC CASLIN MOUNTAIN NW QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

FOREST COUNTY, WISCONSIN
MC CASLIN MOUNTAIN NE QUADRANGLE
SHEET NUMBER 89
3.75 MINUTE SERIES

(Joins sheet 78, Goodman SW SE)



(Joins sheet 88, Mc Caslin Mountain NW)

(Joins sheet 98, Mc Caslin Mountain SE)

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1 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 0 1 KILOMETER

Scale 1:12000

Digital Data: UTM Coordinate System Zone: zone:16
Polyconic Projection
1983 North American Datum

N

SHEET NUMBER 89 OF 98
FOREST COUNTY, WISCONSIN
MC CASLIN MOUNTAIN NE QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

FOREST COUNTY, WISCONSIN

MOLE LAKE SE QUADRANGLE
SHEET NUMBER 90
3.75 MINUTE SERIES

(Joins sheet 81, Mole Lake NE)



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1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER

Scale 1:12000

Digital Data: UTM Coordinate System Zone: zone:16
Polyconic Projection
1983 North American Datum

N

SHEET NUMBER 90 OF 98
FOREST COUNTY, WISCONSIN
MOLE LAKE SE QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

FOREST COUNTY, WISCONSIN

ROBERTS LAKE SW QUADRANGLE
SHEET NUMBER 91
3.75 MINUTE SERIES

(Joins sheet 82, Roberts Lake NW)



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1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER

Scale 1:12000

Digital Data: UTM Coordinate System Zone: zone:16
Polyconic Projection
1983 North American Datum

N

SHEET NUMBER 91 OF 98
FOREST COUNTY, WISCONSIN
ROBERTS LAKE SW QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

FOREST COUNTY, WISCONSIN

ROBERTS LAKE SE QUADRANGLE
SHEET NUMBER 92
3.75 MINUTE SERIES

(Joins sheet 83, Roberts Lake NE)



This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from year 1992 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER

Scale 1:12000

Digital Data: UTM Coordinate System Zone: zone:16
Polyconic Projection
1983 North American Datum

N

SHEET NUMBER 92 OF 98
FOREST COUNTY, WISCONSIN
ROBERTS LAKE SE QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

FOREST COUNTY, WISCONSIN

WABENO SW QUADRANGLE
SHEET NUMBER 93
3.75 MINUTE SERIES

(Joins sheet 84, Wabeno NW)



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1 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 0 1 KILOMETER

Scale 1:12000

Digital Data: UTM Coordinate System Zone: zone:16
Polyconic Projection
1983 North American Datum

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SHEET NUMBER 93 OF 98
FOREST COUNTY, WISCONSIN
WABENO SW QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

FOREST, WISCONSIN

WABENO SE QUADRANGLE
SHEET NUMBER 94
3.75 MINUTE SERIES



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1 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 0 1 KILOMETER

Scale 1:12000

Digital Data: UTM Coordinate System Zone: zone:16
Polyconic Projection
1983 North American Datum

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SHEET NUMBER 94 OF 98
FOREST, WISCONSIN
WABENO SE QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

FOREST COUNTY, WISCONSIN
OTTER LAKE SW QUADRANGLE
SHEET NUMBER 95
3.75 MINUTE SERIES

(Joins sheet 86, Otter Lake NW)

88°37'30"W 45°26'15"N — 88°36'15"W — R. 15 E. — 88°35'W — 88°33'45"W 45°26'15"N

NICOLET NATIONAL FOREST

45°25'N

(Joins sheet 94, Wabeno SE)

(Joins sheet 96, Otter Lake SE)

45°23'45"N

T. 33 N. T. 34 N.

OCONTO COUNTY

45°22'30"N — 88°37'30"W — R. 15 E. — 88°36'15"W — 88°35'W — 88°33'45"W 45°22'30"N

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1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER

Scale 1:12000

Digital Data: UTM Coordinate System Zone: zone:16
Polyconic Projection
1983 North American Datum

N

SHEET NUMBER 95 OF 98
FOREST COUNTY, WISCONSIN
OTTER LAKE SW QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

FOREST COUNTY, WISCONSIN
OTTER LAKE SE QUADRANGLE
SHEET NUMBER 96
3.75 MINUTE SERIES

(Joins sheet 87, Otter Lake NE)



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1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER

Scale 1:12000

Digital Data: UTM Coordinate System Zone: zone:16
Polyconic Projection
1983 North American Datum

N

SHEET NUMBER 96 OF 98
FOREST COUNTY, WISCONSIN
OTTER LAKE SE QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

FOREST COUNTY, WISCONSIN

MC CASLIN MOUNTAIN SW QUADRANGLE
SHEET NUMBER 97
3.75 MINUTE SERIES

(Joins sheet 88, Mc Caslin Mountain NW)



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1 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 0 1 KILOMETER

Scale 1:12000

Digital Data: UTM Coordinate System Zone: zone:16
Polyconic Projection
1983 North American Datum

N

SHEET NUMBER 97 OF 98
FOREST COUNTY, WISCONSIN
MC CASLIN MOUNTAIN SW QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

FOREST COUNTY, WISCONSIN

MC CASLIN MOUNTIAN SE QUADRANGLE
SHEET NUMBER 98
3.75 MINUTE SERIES

(Joins sheet 89 Mc Caslin Mountian NE)



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1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER

Scale 1:12000

Digital Data: UTM Coordinate System Zone: zone:16
Polyconic Projection
1983 North American Datum

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SHEET NUMBER 98 OF 98
FOREST COUNTY, WISCONSIN
MC CASLIN MOUNTIAN SE QUADRANGLE